AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Clean Water Act, as amended, (33 U.S.C. §§1251 et seq.; the "CWA"), and the Massachusetts Clean Waters Act, as amended, (M.G.L. Chap. 21, §§ 26-53),

Middlesex School

is authorized to discharge from the facility located at

Middlesex School Wastewater Treatment Plant
1400 Lowell Road
Concord, MA 01742

to receiving water named

Spencer Brook
(Concord River Watershed – MA 82)

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective on the first day of the calendar month immediately following 60 days after signature.

This permit and the authorization to discharge expire at midnight, five (5) years from the effective date.

This permit supersedes the permit issued on March 3, 2005.

This permit consists of 14 pages in Part I including effluent limitations and monitoring requirements, 25 pages in Part II Standard Conditions, and Attachment A – Revised Freshwater Chronic Toxicity Test Procedure and Protocol and Attachment B – Summary of Required Reports.

Signed this 9th day of November, 2011

/S/SIGNATURE ON FILE

Stephen S. Perkins, Director
Office of Ecosystem Protection
Environmental Protection Agency
Boston, MA

David Ferris, Director
Massachusetts Wastewater Management Program
Department of Environmental Protection
Commonwealth of Massachusetts
Boston, MA

PART I

A.1. During the period beginning on the effective date and lasting through expiration, the permittee is authorized to discharge treated effluent from outfall serial number **001** to Spencer Brook. Such discharges shall be limited and monitored as specified below. All samples shall be representative of the discharge.

EFFLUENT CHARACTERISTIC	**EFFLUENT LIMITS**					**MONITORING REQUIREMENTS** [3]	
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE[2] TYPE**
FLOW[2]	*********	*********	0.052 MGD	*********	**********	CONTINUOUS	RECORDER
FLOW	*********	*********	Report MGD	*********	Report MGD	CONTINUOUS	RECORDER
BOD_5 [4]	4.3 lbs/Day	4.3 lbs/Day	10 mg/l	10 mg/l	Report mg/l	1/WEEK	24-HOUR COMPOSITE[5]
TSS [4]	4.3 lbs/Day	6.5 lbs/Day	10 mg/l	15 mg/l	Report mg/l	1/WEEK	24-HOUR COMPOSITE[5]
pH RANGE[1]	6.5 - 8.3 SU (SEE PERMIT PAGE 6 OF 14, PARAGRAPH I.A.1.b.)					1/DAY	GRAB
TOTAL CHLORINE RESIDUAL[6,7]	*********	**********	26 µg/l	*********	45 µg/l	10/WEEK	GRAB
ESCHERICHIA COLI [1,6]	*********	**********	126 cfu/100 ml	*********	409 cfu/100 ml	1/WEEK	GRAB
DISSOLVED OXYGEN[8]	*********	**********	5 mg/l minimum	*********	**********	1/WEEK	GRAB

CONTINUED FROM PREVIOUS PAGE

A.1. During the period beginning the effective date and lasting through expiration, the permittee is authorized to discharge from treated effluent from outfall serial number **001** to Spencer Brook. Such discharges shall be limited and monitored as specified below.

EFFLUENT CHARACTERISTIC	**EFFLUENT LIMITS**					**MONITORING REQUIREMENTS [3]**	
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE**
AMMONIA-NITROGEN (May 1 – October 31)	Report lbs/Day	Report lbs/Day	1.0 mg/l	1 mg/l	1.5 mg/l	1/WEEK	24-HOUR COMPOSITE[5]
AMMONIA-NITROGEN (November 1 – April 30)	**********	**********	Report	*********	Report	1/MONTH	24-HOUR COMPOSITE[5]
PHOSPHORUS, TOTAL[9] (April 1st – October 31st) (November 1st – March 31st)	**********	**********	 200 µg/l 1,000 µg/l	*********	 Report µg/l Report µg/l	1/MONTH	24-HOUR COMPOSITE[5]
UPSTREAM TOTAL PHOSPHORUS[10] (April 1st – October 31st)	**********	**********	Report µg/l	**********	*********	1/MONTH	GRAB
TOTAL COPPER[11]	**********	**********	10 µg/l	**********	16 µg/l	1/MONTH	24-HOUR COMPOSITE[5]
TOTAL ALUMINUM[9,12]	**********	**********	87 µg/l	**********	Report µg/l	1/MONTH	24-HOUR COMPOSITE[5]
WHOLE EFFLUENT TOXICITY[13,14,15,16] Acute LC_{50} Chronic C-NOEC Total Residual Chlorine Total Cadmium Total Lead Total Copper Total Zinc Total Nickel Total Aluminum	 > 100% > 42% Report maximum daily, µg/l Report maximum daily, µg/l Report maximum daily, µg/l Report maximum daily, µg/l Report maximum daily, µg/l Report maximum daily, µg/l Report maximum daily, µg/l					4/YEAR	24-HOUR COMPOSITE[5]

Footnotes:

1. Required for State Certification.

2. Report annual average, monthly average, and the maximum daily flow. The limit is an annual average, which shall be reported as a rolling average. The value will be calculated as the arithmetic mean of the monthly average flow for the reporting month and the monthly average flows of the previous eleven months.

3. All samples shall be representative of the discharge from outfall 001. A routine sampling program shall be developed in which samples are taken at the same location, same time and same days of the week each month. Occasional deviations from the routine sampling program are allowed, but the reason for the deviation shall be documented in correspondence appended to the applicable discharge monitoring report. All samples shall be tested using the analytical methods found in 40 CFR§136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR§136.

4. Sampling required for influent and effluent.

5. 24-hour composite samples will consist of at least twenty four (24) grab samples taken during one consecutive 24 hour period, either collected at equal intervals and combined proportional to flow or continuously collected proportionally to flow.

6. The monthly average limit for *E. coli* is expressed as a geometric mean. *E. coli* monitoring shall be conducted concurrently with a total residual chlorine sample.

7. The total residual chlorine limitations are in effect year-round.

   The minimum level (ML) for total residual chlorine is defined as 20 µg/l. This value is the minimum level for chlorine using EPA approved methods found in the most currently approved version of Standard Methods for the Examination of Water and Wastewater, Method 4500 CL-E and G. One of these methods must be used to determine total residual chlorine. For effluent limitations less than 20 µg/l, compliance/non-compliance will be determined based on the ML. Sample results of 20 µg/l or less shall be reported as zero on the discharge monitoring report.

   If future monitoring indicates no detectable levels of TRC in the effluent for a period of 12 consecutive months, the permittee may request a reduction in monitoring requirements. The permittee is required to continue monitoring at the frequency specified in the permit until notice is received by certified mail from the EPA that the monitoring requirement has been changed.

   In addition, after the cleaning solution is discharged to the aeration tank, TRC monitoring will occur in this tank and must be non-detect before the membrane tank and associated

flow train produce effluent. All TRC monitoring results from the aeration tank will be recorded and submitted as an attachment to monthly DMRs.

8. See Part I.E. for special conditions.

9. Total effluent phosphorus and aluminum samples shall be collected concurrently. During the winter months (November 1st – March 31st), the permittee shall optimize phosphorus removal by maintaining the chemical dosing rate used during the summer months. Daily chemical dosing rates for each date shall be reported with the monthly DMR year-round.

10. Upstream total phosphorus shall be monitored monthly from April 1st through October 31st at the same site used for upstream dissolved oxygen sampling as required in Part I.E.

11. The minimum level (ML) for copper is defined as 3 µg/l. This value is the minimum level for copper using the Furnace Atomic Absorption analytical method (EPA Method 220.2). This method or other EPA-approved method with an equivalent or lower ML shall be used for effluent limitations less than 3 µg/l. Compliance/non-compliance will be determined based on the ML. Sampling results of 3 µg/l or less shall be reported as zero on the Discharge Monitoring Report.

12. In the event that future WET chemistry sampling shows that aluminum levels in Spencer Brook and in the discharge are less than the state chronic water quality criteria of 87 µg/l, the permittee may request a modification of the effluent limit. At least four instream samples and twelve effluent samples (one year of data) would be the minimum number of samples necessary to support such a modification request.

13. The permittee shall conduct chronic (and modified acute) toxicity tests four times per year. The chronic test may be used to calculate the acute LC50 at the 48 hour exposure interval. The permittee shall test the daphnid, *Ceriodaphnia dubia*, only. Toxicity test samples shall be collected during the second week of the months of March, June, September, and December. The test results shall be submitted by the last day of the month following the completion of the test. The results are due April 30th, July 31st, October 31st and January 31st, respectively. The tests must be performed in accordance with test procedures and protocols specified in Attachment A of this permit.

Test Dates Second Week in	**Submit Results By:**	**Test Species**	**Acute Limit LC_{50}**	**Chronic Limit C-NOEC**
March June September December	April 30 July 31 October 31 January 31	Ceriodaphnia dubia (daphnid)	≥ 100%	≥ 42%

14. The LC50 is the concentration of effluent which causes mortality to 50% of the test organisms. Therefore, a 100% limit means that a sample of 100% effluent (no dilution) shall cause no more than a 50% mortality rate.

15. C-NOEC (chronic-no observed effect concentration) is defined as the highest concentration of toxicant or effluent to which organisms are exposed in a life cycle or partial life cycle test which causes no adverse effect on growth, survival, or reproduction, based on a statistically significant difference from dilution control, at a specific time of observation as determined from hypothesis testing. Under the NPDES program, as indicated in the EPA WET Method Manual EPA 821-R-02-013, Section 10.2.6.2, all test results are to be reviewed and reported in consultation with EPA guidance on the evaluation of the concentration-response relationship. The "42% or greater" limit is defined as a sample which is composed of 42% (or greater) effluent, the remainder being dilution water.

16. If toxicity test(s) using receiving water as diluent show the receiving water to be toxic or unreliable, the permittee shall either follow procedures outlined in Attachment A (Toxicity Test Procedure and Protocol) Section IV., DILUTION WATER in order to obtain an individual approval for use of an alternate dilution water, or the permittee shall follow the Self-Implementing Alternative Dilution Water Guidance which may be used to obtain automatic approval of an alternate dilution water, including the appropriate species for use with that water. This guidance is found at http://epa.gov/region1/npdes/permits/generic/Alternatedilutionwaterguidance.pdf. If this guidance is revoked, the permittee shall revert to obtaining individual approval as outlined in Attachment A. Any modification or revocation to this guidance will be transmitted to the permittees. However, at any time, the permittee may choose to contact EPA-New England directly using the approach outlined in Attachment A.

Part I.A.1. (Continued)

a. The discharge shall not cause a violation of the water quality standards of the receiving waters.

b. The pH of the effluent shall not be less than 6.5 or greater than 8.3 at any time.

c. The discharge shall not cause objectionable discoloration of the receiving waters.

d. The effluent shall not contain a visible oil sheen, foam, or floating solids at any time.

e. The permittee's treatment facility shall maintain a minimum of 85 percent removal of both total suspended solids and biochemical oxygen demand. The percent removal shall be based on monthly average values.

f. Chlorine may only be used for membrane cleaning. No other use of chlorine is authorized by this permit.

g. The results of sampling for any parameter done in accordance with EPA approved methods above its required frequency must also be reported.

h. If the average annual flow in any calendar year exceeds 80 percent of the facility's design flow, the permittee shall submit a report to MassDEP by March 31 of the following calendar year describing its plans for further flow increases and describing how it will maintain compliance with the flow limit and all other effluent limitations and conditions.

2. Toxics Control

a. The permittee shall not discharge any pollutant or combination of pollutants in toxic amounts.

b. Any toxic components of the effluent shall not result in any demonstrable harm to aquatic life or violate any state or federal water quality standard that has been or may be promulgated. Upon promulgation of any such standard, this permit may be revised or amended in accordance with such standards.

3. Numerical Effluent Limitations for Toxicants

EPA or MassDEP may use the results of the toxicity tests and chemical analyses conducted pursuant to this permit, as well as national water quality criteria developed pursuant to Section 304(a)(1) of the Clean Water Act (CWA), state water quality criteria, and any other appropriate information or data, to develop numerical effluent limitations for any pollutants, including but not limited to those pollutants listed in Appendix D of 40 CFR Part 122.

B. UNAUTHORIZED DISCHARGES

The permittee is authorized to discharge only in accordance with the terms and conditions of this permit and only from the outfall(s) listed in Part I. A.1.of this permit. Discharges of wastewater from any other point sources, including sanitary sewer overflows (SSOs), are not authorized by this permit and shall be reported to EPA and MassDEP in accordance with Section D.1.e. (1) of Part II Standard Conditions of this permit (Twenty-four hour reporting).

Notification of SSOs to MassDEP shall be made on its SSO Reporting Form (which includes DEP Regional Office telephone numbers). The reporting form and instruction for its completion may be found on-line at http://www.mass.gov/dep/water/approvals/surffms.htm#sso.

C. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

Operation and maintenance of the sewer system shall be in compliance with the General Requirements of Part II and the following terms and conditions:

1. Maintenance Staff

   The permittee shall provide an adequate staff to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit.

2. Preventative Maintenance Program

   The permittee shall maintain an ongoing preventative maintenance program to prevent overflows and bypasses caused by malfunctions or failures of the sewer system infrastructure. The program shall include an inspection program designed to identify all potential and actual unauthorized discharges.

3. Infiltration/Inflow Control Plan:

   The permittee shall continue to implement a plan for controlling infiltration and inflow (I/I) to the separate sewer system. The plan shall be updated and submitted to EPA and MassDEP **within six months of the effective date of this permit** (see page 1 of this permit for the effective date) and shall describe the permittee's program for preventing infiltration/inflow related effluent limit violations, and all unauthorized discharges of wastewater, including overflows and by-passes due to excessive infiltration/inflow.

   The plan shall include:

   a. An ongoing program to identify and remove sources of infiltration and inflow. The program shall include the necessary funding level and the source(s) of funding.

   b. An inflow identification and control program that focuses on the disconnection

and redirection of illegal sump pumps and roof down spouts. Priority should be given to removal of public and private inflow sources that are upstream from, and potentially contribute to, known areas of sewer system backups and/or overflows.

c. Identification and prioritization of areas that will provide increased aquifer recharge as the result of reduction/elimination of infiltration and inflow to the system.

d. An educational public outreach program for all aspects of I/I control, particularly private inflow (if applicable).

4. Annual Infiltration/Inflow Report

A summary report of all actions taken to minimize I/I during the previous calendar year shall be submitted to EPA and MassDEP annually, **by March 31**. The summary report shall, at a minimum, include:

a. A map and a description of inspection and maintenance activities conducted and corrective actions taken during the previous year.

b. Expenditures for any infiltration/inflow related maintenance activities and corrective actions taken during the previous year

c. A map with areas identified for I/I-related investigation/action in the coming year.

d. A calculation of the annual average I/I and the maximum monthly I/I for the reporting year.

e. A report of any infiltration/inflow related corrective actions taken as a result of unauthorized discharges reported pursuant to 314 CMR 3.19(20) and reported pursuant to the Unauthorized Discharges section of this permit.

5. Alternate Power Source

In order to maintain compliance with the terms and conditions of this permit, the permittee shall continue to provide an alternative power source with which to sufficiently operate its treatment works (as defined at 40 CFR §122.2).

D. SLUDGE CONDITIONS

1. The permittee shall comply with all existing federal and state laws and regulations that apply to sewage sludge use and disposal practices, including EPA regulations promulgated at 40 CFR Part 503, which prescribe "Standards for the Use or Disposal of Sewage Sludge" pursuant to Section 405(d) of the CWA, 33 U.S.C. § 1345(d).

2. If both state and federal requirements apply to the permittee's sludge use and/or disposal

practices, the permittee shall comply with the more stringent of the applicable requirements.

3. The requirements and technical standards of 40 CFR Part 503 apply to the following sludge use or disposal practices.

   a. Land application - the use of sewage sludge to condition or fertilize the soil

   b. Surface disposal - the placement of sewage sludge in a sludge only landfill

   c. Sewage sludge incineration in a sludge only incinerator

4. The requirements of 40 CFR Part 503 do not apply to facilities that dispose of sludge in a municipal solid waste landfill. 40 CFR § 503.4. These requirements also do not apply to facilities which do not use or dispose of sewage sludge during the life of the permit but rather treat the sludge (e.g. lagoons, reed beds), or are otherwise excluded under 40 CFR § 503.6.

5. The 40 CFR Part 503 requirements include the following elements:

   a. General requirements
   b. Pollutant limitations
   c. Operational Standards (pathogen reduction requirements and vector attraction reduction requirements)
   d. Management practices
   e. Record keeping
   f. Monitoring
   g. Reporting

   Which of the 40 C.F.R. Part 503 requirements apply to the permittee will depend upon the use or disposal practice followed and upon the quality of material produced by a facility. The EPA Region 1 Guidance document, "EPA Region 1 - NPDES Permit Sludge Compliance Guidance" (November 4, 1999), may be used by the permittee to assist it in determining the applicable requirements.[1]

1 This guidance document is available upon request from EPA Region 1 and may also be found at: http://www.epa.gov/region1/npdes/permits/generic/sludgeguidance.pdf

6. The sludge shall be monitored for pollutant concentrations (all Part 503 methods), pathogen reduction, and vector attraction reduction (land application and surface disposal) at the following frequency. This frequency is based upon the volume of sewage sludge generated at the facility in dry metric tons per year

less than 290	1/ year
290 to less than 1,500	1 /quarter
1,500 to less than 15,000	6 /year
15,000 +	1 /month

Sampling of the sewage sludge shall use the procedures detailed in 40 CFR 503.8.

7. Under 40 CFR § 503.9(r), the permittee is a "person who prepares sewage sludge" because it "is … the person who generates sewage sludge during the treatment of domestic sewage in a treatment works …." If the permittee contracts with *another* "person who prepares sewage sludge" under 40 CFR § 503.9(r) – i.e., with "a person who derives a material from sewage sludge" – for use or disposal of the sludge, then compliance with Part 503 requirements is the responsibility of the contractor engaged for that purpose. If the permittee does not engage a "person who prepares sewage sludge," as defined in 40 CFR § 503.9(r), for use or disposal, then the permittee remains responsible to ensure that the applicable requirements in Part 503 are met. 40 CFR §503.7. If the ultimate use or disposal method is land application, the permittee is responsible for providing the person receiving the sludge with notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

8. The permittee shall submit an annual report containing the information specified in the 40 CFR Part 503 requirements (§ 503.18 (land application), § 503.28 (surface disposal), or § 503.48 (incineration)) by **February 19** (*see also* "EPA Region 1 - NPDES Permit Sludge Compliance Guidance"). Reports shall be submitted to the address contained in the reporting section of the permit. If the permittee engages a contractor or contractors for sludge preparation and ultimate use or disposal, the annual report need contain only the following information:

   - Name and address of contractor(s) responsible for sludge preparation, use or disposal
   - Quantity of sludge (in dry metric tons) from the WWTP that is transferred to the sludge contractor(s), and the method(s) by which the contractor will prepare and use or dispose of the sewage sludge.

E. SPECIAL CONDITIONS

Dissolved oxygen sampling of Spencer Brook shall be conducted one day per week at locations upstream and downstream of the outfall from June 1 to October 31 of each year. Downstream sampling shall be done one day per week on the upstream side of the Lindsay Pond Road Bridge. The upstream sample shall be taken on the same day outside the discharge's zone of influence and at a reasonably accessible location. Two samples shall be taken at each site per day, one in the early morning (before 8:00 am) and the

other in the late afternoon (after 3:00 pm). Results from all instream dissolved oxygen monitoring, including sample time and date, must be attached to the monthly DMR.

Middlesex School may request a reduction or elimination of instream dissolved oxygen requirements if data shows that Spencer Brook is consistently meeting the dissolved oxygen water quality standard of 5.0 mg/l under 7Q10 or near-7Q10 conditions. Middlesex School is required to continue monitoring at the frequency specified in the permit until notice is received by certified mail from the EPA that the monitoring requirement has been changed.

F. MONITORING AND REPORTING

1. **For a period of one year from the effective date of the permit**, the permittee may either submit monitoring data and other reports to EPA in hard copy form or report electronically using NetDMR, a web-based tool that allows permittees to electronically submit discharge monitoring reports (DMRs) and other required reports via a secure internet connection. **Beginning no later than one year after the effective date of the permit**, the permittee shall begin reporting using NetDMR, unless the facility is able to demonstrate a reasonable basis that precludes the use of NetDMR for submitting DMRs and reports. Specific requirements regarding submittal of data and reports in hard copy form and for submittal using NetDMR are described below:

a. Submittal of Reports Using NetDMR

NetDMR is accessed from: http://www.epa.gov/netdmr. **Within one year of the effective date of this permit**, the permittee shall begin submitting DMRs and reports required under this permit electronically to EPA using NetDMR, unless the facility is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs and reports ("opt-out request"). DMRs shall be submitted electronically to EPA no later than the 15th day of the month following the completed reporting period. All reports required under the permit shall be submitted to EPA, including the MassDEP Monthly Operations and Maintenance Report, as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA and will no longer be required to submit hard copies of DMRs to MassDEP. However, permittees shall continue to send hard copies of reports other than DMRs (including Monthly Operation and Maintenance Reports) to MassDEP until further notice from MassDEP.

b. Submittal of NetDMR Opt-Out Requests

Opt-out requests must be submitted in writing to EPA for written approval at least sixty (60) days prior to the date a facility would be required under this permit to begin using NetDMR. This demonstration shall be valid for twelve (12) months from the date of EPA approval and shall thereupon expire. At such time, DMRs and reports shall be submitted electronically to EPA unless the permittee submits a renewed opt-out request

and such request is approved by EPA. All opt-out requests should be sent to the following addresses:

Attn: NetDMR Coordinator
U.S. Environmental Protection Agency, Water Technical Unit
5 Post Office Square, Suite 100 (OES04-4)
Boston, MA 02109-3912

And

Massachusetts Department of Environmental Protection
Surface Water Discharge Permit Program
627 Main Street, 2nd Floor
Worcester, Massachusetts 01608

c. Submittal of Reports in Hard Copy Form

Monitoring results shall be summarized for each calendar month and reported on separate hard copy Discharge Monitoring Report Form(s) (DMRs) postmarked no later than the 15th day of the month following the completed reporting period. All reports required under this permit, including MassDEP Monthly Operation and Maintenance Reports, shall be submitted as an attachment to the DMRs. Signed and dated originals of the DMRs, and all other reports or notifications required herein or in Part II shall be submitted to the Director at the following address:

U.S. Environmental Protection Agency
Water Technical Unit (OES04-SMR)
5 Post Office Square - Suite 100
Boston, MA 02109-3912

Duplicate signed copies of all reports or notifications required above shall be submitted to the State at the following addresses:

MassDEP – Northeast Region
Bureau of Resource Protection
205B Lowell Street
Wilmington, MA 01887

Copies of toxicity test reports only:

Massachusetts Department of Environmental Protection
Surface Water Discharge Permit Program
627 Main Street, 2nd Floor
Worcester, Massachusetts 01608

Any verbal reports, if required in **Parts I** and/or **II** of this permit, shall be made to both

EPA-New England and to MassDEP.

G. STATE PERMIT CONDITIONS

1. This authorization to discharge includes two separate and independent permit authorizations. The two permit authorizations are (i) a federal National Pollutant Discharge Elimination System permit issued by the U.S. Environmental Protection Agency (EPA) pursuant to the Federal Clean Water Act, 33 U.S.C. §§1251 et seq.; and (ii) an identical state surface water discharge permit issued by the Commissioner of the Massachusetts Department of Environmental Protection (MassDEP) pursuant to the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53, and 314 C.M.R. 3.00. All of the requirements contained in this authorization, as well as the standard conditions contained in 314 CMR 3.19, are hereby incorporated by reference into this state surface water discharge permit.

2. This authorization also incorporates the state water quality certification issued by MassDEP under § 401(a) of the Federal Clean Water Act, 40 C.F.R. 124.53, M.G.L. c. 21, § 27 and 314 CMR 3.07. All of the requirements (if any) contained in MassDEP's water quality certification for the permit are hereby incorporated by reference into this state surface water discharge permit as special conditions pursuant to 314 CMR 3.11.

3. Each agency shall have the independent right to enforce the terms and conditions of this permit. Any modification, suspension or revocation of this permit shall be effective only with respect to the agency taking such action, and shall not affect the validity or status of this permit as issued by the other agency, unless and until each agency has concurred in writing with such modification, suspension or revocation. In the event any portion of this permit is declared invalid, illegal or otherwise issued in violation of state law; such permit shall remain in full force and effect under federal law as a NPDES Permit issued by the U.S. Environmental Protection Agency. In the event this permit is declared invalid, illegal or otherwise issued in violation of federal law, this permit shall remain in full force and effect under state law as a permit issued by the Commonwealth of Massachusetts.

Summary of Required Report Submittals*

Required Report	Date Due	Submitted by:	Submitted to:
Whole Effluent Toxicity Test Report (Part I.A.1)	January 31, April 30, July 31, and October 31 of each year	Middlesex School	Via NetDMR Or Environmental Protection Agency Water Technical Unit 5 Post Office Square, Suite 100 (OES04-4) Boston, MA 02109-3912
			MassDEP Division of Watershed Management Surface Water Discharge Permit Program 627 Main Street, 2nd Floor Worcester, MA 01608
Infiltration/Inflow Control Plan (Part I.C.3)	Within 6 months of the effective date	Middlesex School	Via NetDMR Or U.S. Environmental Protection Agency Water Technical Unit 5 Post Office Square, Suite 100 (OES04-4) Boston, MA 02109-3912
			MassDEP Bureau of Resource Protection Northeast Regional Office 205B Lowell Street Wilmington, MA 01887
Notification of Sanitary Sewer Overflows (Part I.B.)	Oral Report -Within 24 hours of discovery of event Written Report – Within 5 calendar days of discovery of event	Middlesex School	Written report via NetDMR Or U.S. Environmental Protection Agency Water Technical Unit 5 Post Office Square, Suite 100 (OES04-4) Boston, MA 02109-3912

Required Report	Date Due	Submitted by:	Submitted to:
			MassDEP Bureau of Resource Protection Northeast Regional Office 205B Lowell Street Wilmington, MA 01887
Annual I/I Report (Part I. C.4)	Annually by March 31	Middlesex School	Via NetDMR Or U.S. Environmental Protection Agency Water Technical Unit 5 Post Office Square, Suite 100 (OES04-4) Boston, MA 02109-3912
			MassDEP Bureau of Resource Protection Northeast Regional Office 205B Lowell Street Wilmington, MA 01887
Annual Sludge Report (Part I.D.8)	Annually by February 19	Middlesex School	Via NetDMR or U.S. Environmental Protection Agency Water Technical Unit 5 Post Office Square, Suite 100 (OES04-4) Boston, MA 02109-3912
			MassDEP Bureau of Resource Protection Northeast Regional Office 205B Lowell Street Wilmington, MA 01887

* This table is a summary of the reports required to be submitted under this NPDES permit as an aid to the permittee(s). If there are any discrepancies between the permit and this summary, the permittee(s) shall follow the permit requirements.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND - REGION I
5 POST OFFICE SQUARE, SUITE 100
BOSTON, MA 02109-3912

FACT SHEET

DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES

NPDES PERMIT NO: **MA0102466**

NAME AND ADDRESS OF PERMITTEE:

Middlesex School
1400 Lowell Road
Concord, MA 01742

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Middlesex School Wastewater Treatment Plant
1400 Lowell Road
Concord, MA 01742

RECEIVING WATERS: **Spencer Brook (MA82B-15)**

CLASSIFICATION: **Class B - Warm Water Fishery**

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I. PROPOSED ACTION

The above named applicant has applied to the U.S. Environmental Protection Agency for the re-issuance of its National Pollutant Discharge Elimination System (NPDES) permit to discharge into the designated receiving water. A timeline is presented below:

- March 3, 2005: EPA reissues permit.
- April 1, 2005: Middlesex School appeals the permit requirement for upstream dissolved oxygen monitoring on the grounds that no upstream site is accessible.
- September 28, 2005: EPA issues a permit modification removing the upstream monitoring requirement, resolving the appeal.
- November 26, 2005: The permit becomes effective.
- September 15, 2009: Middlesex School submits reissuance application.
- April 30, 2010: the permit expires but is administratively continued.

The draft permit proposes an expiration date five (5) years from the effective date of the final permit.

II. TYPE OF FACILITY AND DISCHARGE LOCATION

The facility's discharge outfalls are listed below:

Outfall	Description of Discharge	Receiving Water	Outfall Location
001	Treated Effluent	Spencer Brook	42º, 29', 45" N 71º, 22', 37" W

The wastewater treatment plant serves a private school. The school maintains a wastewater collection system and conveys the wastewater to the plant for treatment, which discharges via Outfall 001 to Spencer Brook. During the last permit renewal process, the location and condition of the outfall pipe was called into question. EPA required Middlesex School to verify the condition and actual discharge location of the outfall pipe within three months of the effective date of the permit. Middlesex School determined that the outfall pipe, which crossed a wetland to discharge to Spencer Brook, was breached and effectively discharged to the wetland.

On January 27, 2010, Weston & Sampson, the WWTP contract operator, submitted certification that a new outfall to Spencer Brook had been completed and that the treatment plant was connected to the new outfall on January 12, 2009. The outfall now discharges only to Spencer Brook and not to any wetland area (discharge location shown on Figure 1). This work was verified on October 27, 2010 during a site visit with EPA and MassDEP staff.

The collection system is 100% separate sanitary sewers. There have been no reported sanitary sewer overflows (SSOs) during the current permit term.

III. DESCRIPTION OF DISCHARGE

Quantitative descriptions of the discharge in terms of significant effluent parameters, based on discharge monitoring reports (DMRs) submitted for July 2007 through June 2010, are shown in Appendix A of this fact sheet.

IV. LIMITATIONS AND CONDITIONS

The effluent limitations and monitoring requirements may be found in the draft NPDES permit.

V. PERMIT BASIS AND EXPLANATION OF EFFLUENT LIMITATION DERIVATION

A. PROCESS DESCRIPTION

The Middlesex School Wastewater Treatment Plant (WWTP), located in Concord, Massachusetts, is a package-type microfiber membrane filtration treatment plant providing advanced wastewater treatment. It has a permitted average monthly flow of 0.052 million gallons per day (MGD) and serves a population of about 500 students and staff. See Figure 1 for the site location. Middlesex School completed improvements to the wastewater treatment facility in the Fall of 2000, including a flow equalization tank that assists in equalizing the strength of the influent wastewater, and a UV disinfection system, which replaced the chlorination system.

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. Overview of Federal and State Regulations

EPA is issuing this permit pursuant to Section 402(a) of the Clean Water Act. The Commonwealth of Massachusetts is also issuing this permit pursuant to Massachusetts General Laws ch. 21, § 43 (2004).

The Clean Water Act (CWA) prohibits the discharge of pollutants to waters of the United States without a National Pollutant Discharge Elimination System (NPDES) permit unless such a discharge is otherwise authorized by the CWA. The NPDES permit is the mechanism used to implement technology and water quality-based effluent limitations and other requirements including monitoring and reporting. The draft NPDES permit was developed in accordance with various statutory and regulatory requirements established pursuant to the CWA and any applicable State administrative rules. The regulations governing EPA's NPDES permit program are generally found in 40 CFR Parts 122, 124, 125 and 136.

EPA is required to consider technology and water quality based requirements when developing permit limits. The criteria and standards that EPA must use to determine technology-based requirements are set in 40 CFR Part 125, Subpart A. Requirements under Section 301(b) of the

CWA and/or requirements established on a case-by-case basis under Section 402(a)(1) should be included in the permit.

The CWA requires that dischargers satisfy both minimum technology and water quality requirements. Technology-based requirements are found in Section 301(b) of the CWA. Section 301(b)(1)(A) of the CWA requires the application of Best Practicable Control Technology Currently Available (BPT) with the statutory deadline for compliance having been July 1, 1977, unless otherwise authorized by the CWA. Section (301)(b)(2) of the CWA requires the application of Best Conventional Control Technology (BCT) for conventional pollutants, and Best Available Technology Economically Achievable (BAT) for non-conventional and toxic pollutants. The compliance deadline for BCT and BAT was as expeditiously as practicable, but in no case later than three years after the date such limitations are promulgated and no later than March 31, 1989.

EPA has not promulgated effluent guidelines for privately owned treatment plants treating domestic wastewater. The treatment technologies applied to this wastewater are the same as those used at POTWs, and the wastewater characteristics are also very similar. EPA has used the secondary treatment requirements found at 40 CFR Part 133 for Publicly Owned Treatment Works (POTWs) as the basis for establishing technology-based effluent limits for this permit.

When technology-based effluent limits are included in a permit, compliance with those limitations is from the date the issued permit becomes effective. See 40 CFR §125.3(a)(1). Compliance schedules and deadlines not in accordance with the statutory provisions of the CWA cannot be authorized by an NPDES permit. Compliance schedules to meet water quality based effluent limits may be included in permits only when the state's water quality standards clearly authorize such schedules and where the limits are established to meet a water quality standard that is either newly adopted, revised, or interpreted after July 1, 1977.

Section 301(b)(1)(C) of the CWA requires NPDES permits to contain effluent limits more stringent than technology-based limits where more stringent limits are necessary to comply with, among other things, applicable state or federal water quality standards. A water quality standard consists of three elements: (1) beneficial designated use or uses for a water body or a segment of a water body; (2) numeric and narrative water quality criteria sufficient to protect the assigned designated use(s); and (3) antidegradation requirements to ensure that existing uses and high quality waters are protected and maintained.

EPA's regulation at 40 C.F.R. § 122.4(d) prohibits the issuance of an NPDES permit unless its conditions can "ensure compliance with the applicable water quality requirements of all affected States." Similarly, 40 C.F.R. §122.44(d) requires EPA to impose conditions that achieve applicable water quality standards.

The Massachusetts Surface Water Quality Standards (314 CMR 4.00, September 2006) establish designated uses of the State's waters, criteria to protect those uses, and an antidegradation provision to ensure that existing uses and high quality waters are protected and maintained.

They also include requirements for the regulation and control of toxic constituents and specify that EPA's recommended water quality criteria, established pursuant to Section 304(a) of the CWA, shall be used unless a site-specific criterion is established.

Section 401(a)(1) of the CWA forbids the issuance of a federal license for a discharge to waters of the United States unless the state where the discharge originates either certifies that the discharge will comply with, among other things, state water quality standards, or waives certification. EPA's regulations at 40 CFR § 122.44(d)(3), §124.53 and §124.55 describe the manner in which NPDES permits must conform to conditions contained in state certifications.

Section 402(o) of the CWA provides, generally, that the effluent limitations of a renewed, reissued, or modified permit must be at least as stringent as the comparable effluent limitations in the previous permit. Unless certain limited exceptions are met, "backsliding" from effluent limitations contained in previously issued permits that were based on CWA §§ 301(b)(1)(C) or 303 is prohibited. EPA has also promulgated anti-backsliding regulations, which are found at 40 CFR § 122.44(l). Unless statutory and regulatory backsliding requirements are met, the limits in the reissued permit must be at least as stringent as those in the previous permit.

2. Development of Water Quality-based Limits

Receiving stream requirements are established according to numerical and narrative standards adopted under state law for each stream classification. When using chemical-specific numeric criteria from the state's water quality standards to develop permit limits, both the acute and chronic aquatic life criteria are used and expressed in terms of maximum allowable in-stream pollutant concentration. Maximum daily limits are generally derived from the acute aquatic life criteria, and the average monthly limit is generally derived from the chronic aquatic life criteria. Chemical specific limits are established in accordance with 40 CFR §122.44(d) and §122.45(d).

The permit must limit any pollutant or pollutant parameter (conventional, non-conventional, toxic and whole effluent toxicity) that is or may be discharged at a level that causes or has "reasonable potential" to cause or contribute to an excursion above any water quality criterion. An excursion occurs if the projected or actual instream concentration exceeds the applicable criterion.

In determining reasonable potential, EPA considers: (1) existing controls on point and non-point sources of pollution; (2) pollutant concentration and variability in the effluent and receiving water as determined from the permit application, monthly discharge monitoring reports (DMRs), and State and Federal water quality reports; (3) sensitivity of the species to toxicity testing; (4) statistical approach outlined in *Technical Support Document for Water Quality-based Toxics Controls,* March 1991, EPA/505/2-90-001 in Section 3; and, where appropriate, (5) dilution of the effluent in the receiving water. In accordance with Massachusetts Water Quality Standards [314 CMR 4.03(3)], available dilution for rivers and streams is based on a known or estimated value of the lowest mean flow which occurs for seven (7) consecutive days with a recurrence interval of once in ten (10) years (7Q10).

3. Water Quality Standards; Designated Use; Outfall 001

Spencer Brook in the vicinity of the discharge is classified in the Massachusetts Surface Water Quality Standards (314 CMR 4.00) as a Class B-warm water fishery. Class B waters are designated as a habitat for fish; other aquatic life; and wildlife. Class B waters are also designated for primary and secondary contact recreation. They shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses and should have consistently good aesthetic value.

A warm water fishery is defined in the Massachusetts Surface Water Quality Standards (314 CMR 4.02) as waters in which the maximum mean monthly temperature generally exceeds 20º Celsius (68º Fahrenheit) during the summer months and are not capable of supporting a year-round population of cold water stenothermal aquatic life.

Section 303(d) of the Federal Clean Water Act (CWA) requires states to identify those waterbodies that are not expected to meet surface water quality standards after the implementation of technology-based controls and, as such, require the development of total maximum daily loads (TMDL). Spencer Brook (MA82B-15) is listed on the Massachusetts 2008 Integrated List of Waters (303d) as Category 3: No Uses Assessed.

Spencer Brook is a tributary to the Assabet River, and the reach of the Assabet River at the confluence of the two rivers (MA82B-07) is listed as impaired due to nutrients, low dissolved oxygen/organic enrichment, and pathogens. While the source of impairments in upstream segments of the Assabet River is cited as municipal point sources (POTWs), there are no large municipal point sources on this reach of the Assabet River. The cause of the impairment on this reach of the river is likely a combination of upstream POTWs, municipal stormwater runoff, internal nutrient recycling, and impoundments. The Assabet River has an approved phosphorus TMDL, which is described in further detail in the Total Phosphorus section of this Fact Sheet (Section 6.B.). Spencer Brook joins the Assabet River approximately 1.25 miles upstream of the Assabet River confluence with the Sudbury River to form the Concord River. The reach of the Concord River from the confluence to the Billerica water supply intake (Segment 82A-07) is listed as impaired for nutrients, metals, and pathogens.

4. Design Flow, 7Q10, and Available Dilution

Water quality based limits are established with the use of a calculated available dilution. Title 314 CMR 4.03(3)(a) requires that effluent dilution be calculated based on the receiving water 7Q10. The 7Q10 is the lowest observed mean river flow for 7 consecutive days, occurring over a 10-year recurrence interval. Additionally, the facility design flow is used to calculate available effluent dilution.

Discharge Flow

Review of facility flow between August 2007 and June 2010 shows that the average flow was 24,000 gallons per day. Also during this period, the range of monthly average effluent flow was between 10,000 and 49,000 gallons per day. This variation is due to the seasonal nature of the school, which holds its primary sessions during the fall and spring, with fewer students attending

during the summer. The facility design flow is 52,000 gallons per day or 0.08 cubic feet per second (cfs). No violation of the design flow occurred during the specified review period.

7Q10

The 7Q10 for many streams is calculated based on data from the United States Geological Survey (USGS) low-flow frequency statistics for gaging stations. Spencer Brook, however, does not have a USGS gage, nor does it have recently recorded flow data. For the current permit, the MassDEP flow policy (December 10, 1985) was used to develop the 7Q10 for Spencer Brook.

As a check on the 7Q10 calculated using the MassDEP policy, a Spencer Brook 7Q10 was also calculated using USGS flow gage data for Nashoba Brook, a nearby watershed with similar drainage characteristics. The 7Q10 calculations are shown below.

The 7Q10 was calculated as follows:

Spencer Brook Drainage Area at Discharge = 5.57 sq. miles (based on USGS StreamStats modeling using USGS and GIS data)

Flow Factor = 0.02 cfs/sq. mile (mean flow factor for drainage areas <10 sq. miles based on Mass DEP Policy "Low Flow Data" dated 12/10/1985)

$$\frac{0.02 \text{ cfs}}{\text{sq. mile}} = \frac{7Q10 \text{ cfs}}{5.57 \text{ sq.mile}}$$

$$7Q10 = \frac{0.02 \text{ cfs}}{\text{sq. mile}} \times 5.57 \text{ sq. miles}$$

7Q10 cfs = 0.11 cfs

Based on the USGS flow records from 1965 - 1990 for the Nashoba Brook, the 7Q10 for the Nashoba Brook watershed is 0.18 cfs. Using the Nashoba Brook's 7Q10 value of 0.18 cfs for a watershed area of 12.8 mi^2, and adjusting the 7Q10 for a watershed area of Spencer Brook, 5.57 mi^2, the adjusted 7Q10 would be 0.08 cfs. This adjusted value (0.08 cfs) is comparable to the 0.11 cfs 7Q10 calculated for Spencer Brook using the MassDEP Policy.

The 7Q10 calculated using the MassDEP Policy was further verified using USGS StreamStats, a computer model that calculates the streamflow of ungaged sites using an interactive GIS map. Streamstats estimated the 7Q10 flow for Spencer Brook at the Middlesex School outfall to be 0.12 cfs. This estimate is comparable to the 7Q10 value used in the current permit; thus the current permit 7Q10, 0.11 cfs, has been carried over into the new draft permit.

Available Dilution

$$\text{Available Dilution} = \frac{\text{Brook Flow + Facility Flow}}{\text{Facility Flow}}$$

Spencer Brook 7Q10 = 0.071 MGD (0.11 cfs)
Middlesex WWTF Flow = 0.052 MGD

$$= \frac{0.071 \text{ MGD} + 0.052 \text{ MGD}}{0.052 \text{ MGD}} = 2.4$$

Therefore, the dilution factor is 2.4.

5. Conventional Pollutants: BOD_5, TSS, pH, and E. coli

A) Biochemical Oxygen Demand (BOD_5)

Although EPA has not promulgated effluent guidelines for privately owned wastewater treatment plants, the secondary treatment requirements set forth at 40 CFR Part 133 for Publicly Owned Treatment Works (POTWs) will serve as the guide for establishing technology-based permit limits for this permit. This rationale is consistent with Best Professional Judgment, as described at Section 401(a)(1) of the Clean Water Act.

The BOD_5 limits in the current permit are 10 mg/l average monthly and 10 mg/l average weekly. The permittee is required to report the maximum daily. From July 2007 through June 2010, Middlesex School violated the weekly average BOD_5 limit twice, with no violations of the average monthly limit. The BOD removal percentage average was 98.4% with one violation because the parameter was not measured.

The current permit limits are more stringent than secondary treatment requirements and have been in place for several permit cycles. The quantitative basis for the permit limit is unclear; however, the 1975 Wasteload Allocation for the Assabet River gave similar limits for facilities, such as the Westborough WWTP, that discharge to other headwater streams in the basin. The reason for this policy is that dilution in the receiving waters is low; thus the limits have been made more stringent to prevent low dissolved oxygen levels immediately downstream of the discharge.

The average monthly and average weekly BOD_5 draft limits are the same as those in the current permit. Average monthly and average weekly BOD_5 must be less than 10 mg/l, and the permittee must report maximum daily BOD_5 each month. Mass limits will remain at 4.3 lbs/day for average monthly and average weekly. Monitoring frequency remains at once per week.

Mass Limitation (lbs/day) = C x PF x 8.34

Where

C = Concentration Limit
PF = Permitted Flow
8.34 = Factor to convert concentration limit in mg/l and permitted flow in MGD to pounds per day.

Average Monthly Mass Limit = 10 mg/l x 0.052 MGD x 8.34 = 4.3 lbs/day
Average Weekly Mass Limit = 10 mg/l x 0.052 MGD x 8.34 = 4.3 lbs/day

In accordance with the provisions set forth at 40 CFR § 133.102(b)(3), the draft permit requires

that the 30-day average percent removal of BOD_5 be no less than 85%.

B) Total Suspended Solids (TSS)

Although EPA has not promulgated effluent guidelines for privately owned wastewater treatment plants, the secondary treatment requirements set forth at 40 CFR Part 133 for Publicly Owned Treatment Works (POTWs) will serve as the guide for establishing technology-based permit limits for this permit. This rationale is consistent with Best Professional Judgment, as described at Section 401(a)(1) of the Clean Water Act.

The TSS limits in the current permit are 10 mg/l average monthly and 15 mg/l average weekly. The permittee is required to report the maximum daily. The facility must remove at least 85% of the TSS of the influent load. From July 2007 through June 2010, Middlesex School violated both the average monthly and average weekly limits once, in August 2007. There have been no further violations during that time.

The current permit limits are more stringent than secondary treatment requirements and have been in place for several permit cycles. As with BOD_5, the quantitative basis for the permit limit is unclear. The reason for the lower limits is to prevent downstream impacts in Spencer Brook, which does not have the flow necessary to assimilate higher TSS loads.

The average monthly and average weekly TSS draft limits are the same as those in the current permit. The draft permit proposes a 10 mg/l average monthly limit, an average weekly limit of 15 mg/l, and the permittee must report maximum daily TSS each month. Mass limits will remain at 4.3 lbs/day and 6.5 lbs/day for average monthly and average weekly, respectively. Monitoring frequency remains at once per week.

Mass Limitation (lbs/day) = C x PF x 8.34

Where

C = Concentration Limit
PF = Permitted Flow
8.34 = Factor to convert concentration limit in mg/l and permitted flow in MGD to pounds per day.

Average Monthly Mass Limit = 10 mg/l x 0.052 MGD x 8.34 = 4.3 lbs/day
Average Weekly Mass Limit = 15 mg/l x 0.052 MGD x 8.34 = 6.5 lbs/day

In accordance with the provisions set forth at 40 CFR § 133.102(b)(3), the draft permit requires that the 30-day average percent removal of TSS be no less than 85%.

C) pH

The draft permit includes pH limitations that are required by state water quality standards and are at least as stringent as pH limitations set forth at 40 C.F.R. § 133.102(c). The pH of the effluent shall not be less than 6.5 or greater than 8.3 standard units at any time.

D) Escherichia coli (E. coli)

The *Escherichia coli* (*E. coli*) limits for Outfall 001 are based on state water quality standards for Class B waters (314 CMR 4.05(3)(b)(4)). The Commonwealth of Massachusetts promulgated *E. coli* criteria in the Surface Water Quality Standards (314 CMR § 4.00) on December 29, 2006, replacing fecal coliform bacteria criteria. These new criteria were approved by EPA on September 27, 2007.

The *E. coli* limits proposed in the draft permit for Outfall 001 are a monthly geometric mean of 126 colony forming units per 100 ml (cfu/100 ml) and a daily maximum of 409 cfu/100 ml (this is the 90% distribution of the geometric mean of 126 cfu/100 ml). The proposed *E. coli* monitoring frequency in the draft permit is once per week. The draft permit requires that *E. coli* samples be collected at the same time as one of the total residual chlorine samples.

E) Dissolved Oxygen

Dissolved oxygen is often a limiting factor in aquatic ecosystems. Absence of dissolved oxygen in the water column can fundamentally change the macroinvertebrate and fish communities, and rapid drops in dissolved oxygen can cause fish die-offs. Massachusetts Surface Water Quality Standards require that Class B warm water fisheries have dissolved oxygen of at least 5.0 mg/l (314 CMR 4.05(3)(b)(1)).

A permit modification that went into effect September 28, 2005 requires downstream ambient monitoring of dissolved oxygen once per week from June 1 to October 31 of each year. The permit modification requires that the permittee sample once before 8:00 am and another time in the afternoon after 3:00 pm to reveal any diurnal fluctuations in dissolved oxygen, which would indicate eutrophic conditions. Middlesex School did not sample before 8:00 am or after 3:00 pm as the permit modification requires. However, the data that was collected, usually around noon according to the permittee, still show many instances of instream dissolved oxygen below 5.0 mg/l and as low as 2.43 mg/l (see Appendix B). Effluent dissolved oxygen was below 5 mg/l five times from April through July 2010, dropping on May 26, 2010 to 3.98 mg/l. Therefore, there is reasonable potential for the discharge to cause or contribute to an excursion from water quality standards.

The draft permit includes an effluent limitation of not less than 5.0 mg/l for dissolved oxygen (DO). Furthermore, the permit carries forward the requirement that Middlesex School sample dissolved oxygen at a downstream location one day per week during the period from June 1 to October 31 each year the permit is in effect. Two samples shall be taken per day, one in the early morning (before 8:00 am) and another in the late afternoon (after 3:00 pm). Middlesex School is also required to monitor dissolved oxygen at an upstream location one day per week, with one sample in the morning and one sample in the afternoon. This monitoring will indicate whether eutrophic conditions occur in Spencer Brook, and the data will be used in development of future NPDES permits for Middlesex School.

Middlesex School may request a reduction or elimination of instream dissolved oxygen requirements if data shows that Spencer Brook is consistently meeting the dissolved oxygen water quality standard of 5.0 mg/l under 7Q10 or near-7Q10 conditions. These conditions usually occur in late summer to early fall. Middlesex School is required to continue monitoring

at the frequency specified in the permit until notice is received by certified mail from the EPA that the monitoring requirement has been changed.

6. Non-Conventional Pollutants

A) Total Residual Chlorine

Chlorine is a toxic chemical, and chlorine compounds produced from the disinfection of wastewater can be extremely toxic to aquatic life. In 2000, Middlesex School WWTP switched from chlorination to UV disinfection. However, chlorine is still used to clean the membrane filtration system. The current permit includes monthly average and daily maximum effluent limits of 0.026 mg/l and 0.045 mg/l, respectively. The permit also requires monitoring and reporting of TRC concentrations in the aeration tank, where the chlorine cleaning solution is discharged, with each monthly DMR. The following paragraphs describe the membrane cleaning processes (Weston and Sampson 2004).

The maintenance clean occurs… approximately every two weeks… and involves backwashing the membranes with the 12.5% hypochlorite solution for 2-3 minute. The membranes then soak with the hypochlorite solution for 15 minutes. This is followed by a second round of membrane backwashing and soaking with the hypochlorite solution. The total volume of 12.5% hypochlorite used in the operation is 2.5 gallons. Further, aeration in the membrane tank does not cease, meaning that much of the free chlorine in the 12.5% solution is oxidized and off-gassed during cleaning. The remainder is oxidized once the recirculation pumps reactivate the normal flow loop between membrane tank and aeration tank.

The frequency of the Cleaning In Place (CIP) procedure is reduced through normal maintenance cleaning operations, and is generally required every 6 months, with each WWTF differing in actual frequency. The process involves the following steps and associated durations:

1. *Heat CIP water in CIP tank – 12 hours*
2. *Drain membrane tank of mixed liquor to aeration tank – 5 minutes*
3. *Fill membrane tank with rinse water – 15 minutes*
4. *Backwash membranes, aerate membrane tank, and recirculate rinse water through membrane tank – 40 minutes*
5. *Drain rinse water to aeration tank – 5 minutes*
6. *Fill membrane tank with heated CIP water and hypochlorite solution – 15 minutes*
7. *Recirculate hypochlorite solution through membranes – 40 minutes*
8. *Soak membranes in hypochlorite solution – 3 hours maximum*
9. *Drain hypochlorite solution to aeration tank – 5 minutes*
10. *Begin recirculation between membrane tank and aeration tank.*

The final step to each cleaning operation involves sampling for chlorine residual in the aeration tank. Specifically, samples will be analyzed until results indicate that the residual has been reduced below detection limits. Until this has been determined, the membrane tank and associated flow train will not produce effluent.

Data reported on the facility's discharge monitoring reports (DMRs) shows ten violations of the maximum daily limit and one violation of the average monthly limit since June 2007. It is apparent that one of the above procedures is not working properly to reduce TRC, or that the TRC is coming from another source.

The proposed limits were calculated by multiplying the dilution factor of 2.4 by the chronic water quality criteria of 11 µg/l (to calculate the monthly average limit) and by the acute criteria of 19 µg/l (to calculate the daily maximum limit). The calculated monthly average limit is 26 µg/l and the maximum daily limit is 45 µg/l. These are the same limits as in the current permit. The frequency of monitoring has been increased to twice per day, 5 days per week. More frequent sampling may assist the permittee in determining the source of the TRC based on other activities occurring at that time. The limits are in effect year-round. In addition, the aeration tank monitoring requirements have been carried over into the draft permit.

If subsequent monitoring indicates no detectable levels of TRC in the effluent for a period of 12 consecutive months, the permittee may request a reduction in monitoring requirements. The permittee is required to continue monitoring at the frequency specified in the permit until notice is received by certified mail from the EPA that the monitoring requirement has been changed.

B) Total Phosphorus

The Massachusetts Surface Water Quality Standards (314 CMR 4.00) do not contain numerical criteria for total phosphorus. The narrative criteria for nutrients is found at 314 CMR 4.05(5)(c), which states that "all surface waters shall be free from nutrients in concentrations that would cause or contribute to impairment of existing or designated uses." The Standards also require that "any existing point source discharge containing nutrients in concentrations that would cause or contribute to cultural eutrophication, including the excessive growth of aquatic plants or algae, in any surface water shall be provided with the most appropriate treatment as determined by the Department, including, where necessary, highest and best practical treatment (HBPT) for POTWs" (314 CMR 4.05(5)(c)). MassDEP has established that a monthly average total phosphorus limit of 0.2 mg/l (200 µg/l) represents highest and best practical treatment for POTWs.

It is well documented that reaches along the Assabet River suffer from eutrophication, a condition primarily caused by excessive nutrients entering and accumulating in the river. Phosphorus and other nutrients (i.e., nitrogen) promote the growth of nuisance algae and rooted aquatic plants. Typically, elevated levels of nutrients will cause excessive algal and/or plant growth resulting in reduced water clarity and poor aesthetic quality. Also, through respiration, and the decomposition of dead plant matter, excessive algae and plant growth can reduce in-stream dissolved oxygen concentrations to levels that could negatively impact aquatic life and/or produce strong unpleasant odors.

The current permit contains a monthly average phosphorus limit of 200 µg/l from April through October of each year, and a limit of 1,000 µg/l during the rest of the year. These limits were based on achieving water quality standards in Spencer Brook. Discharge Monitoring Reports (DMRs) submitted by the permittee over the last 36 months report average monthly total phosphorus values between 70 µg/l and 650 µg/l with a maximum daily value of 710 µg/l. Over a

36-month period from July 2007 through June 2010, there were six violations of the 0.2 mg/l average monthly phosphorus limit: August, September, and October 2007; September and October 2008; and May 2009.

As discussed, Spencer Brook discharges to the Assabet River, which is impaired for nutrients. The Assabet River Phosphorus Total Maximum Daily Load (TMDL) was finalized in 2004. The TMDL established an adaptive, multi-phase plan. A major source of phosphorus in the Assabet River is sediment impounded behind multiple dams along the river. Phase I requires a 90% reduction in phosphorus from point sources (i.e. WWTPs) and evaluation of sediment and/or dam removal to limit phosphorus flux from the sediment.

After publication of the Assabet River TMDL, the US Army Corps of Engineers undertook an intensive modeling effort to better understand sediment phosphorus flux in the Assabet River. That study[1] found that water column phosphorus, particularly during the winter months, played a larger role in eutrophication than previously believed. Because of the strong effect of winter phosphorus discharges on phosphorus sediment flux in subsequent growing seasons, the report recommended winter phosphorus limits below the current limits of 1 mg/l for WWTFs discharging to the river.

Although Middlesex School discharges to Spencer Brook rather than directly to the Assabet River, the phosphorus in its effluent will eventually enter the nutrient-impaired Assabet River. Furthermore, it is expected that the same phosphorus sediment flux processes found in the impoundments of the Assabet River also occur in Spencer Brook, which also contains impoundments.

Therefore, the draft permit carries forward the winter 1 mg/l limit and contains a requirement that phosphorus removal be optimized during the winter months. Dosing rates shall be kept at the same or similar level in the winter as during the summer while staying within the aluminum limit in the draft permit. Daily dosing rates shall be reported with the monthly DMRs. The total phosphorus limit remains at 200 µg/l from April 1st through October 31st. Sampling frequency will be once per month. Total phosphorus samples must be collected at the same time as total aluminum samples. The draft permit also requires monitoring for total phosphorus upstream of the discharge once per month from April 1st through October 31st.

C) Aluminum

Aluminum, in the form of alum or other compounds, is a commonly used chemical additive in wastewater treatment to remove phosphorus. Aluminum compounds are used in the treatment process at the Middlesex School treatment plant. The release of aluminum into the environment can result in levels that are highly toxic to aquatic life. The Massachusetts Water Quality Standards establish that for toxic pollutants not otherwise listed in 314 CMR 4.00, the *National Recommended Water Quality Criteria*: *2002* (US EPA 2002 [EPA-822-R-02-047]) are the allowable receiving water concentration of the affected receiving water (see 314 CMR 4.05(5)(e). The freshwater aluminum aquatic life criteria in the *National Recommended Criteria* are a chronic criterion of 87 µg/l and an acute criterion of 750 µg/l.

[1] Assabet River Sediment and Dam Removal Study Modeling Report. Camp Dresser & McKee, June 2008.

The current permit requires monitoring for aluminum as part of the Whole Effluent Toxicity (WET) testing, which is done quarterly. Both upstream and effluent samples are analyzed. A summary of the aluminum monitoring data from 2008-2010 is presented below in Table 1. All Spencer Brook samples that exceed the chronic aluminum criteria (87 µg/l) are highlighted in yellow.

Table 1 – Aluminum Levels in Middlesex School Effluent and Spencer Brook

Date	Effluent (µg/l)	Spencer Brook (µg/l)
6/8/2008	303	151
9/8/2008	778	270
12/8/2008	234	170
3/8/2009	743	122
6/9/2009	133	121
9/14/2009	19	102
12/7/2009	39	141
3/8/2010	21	123
6/7/2010	30	143
9/14/2010	44	54

The chronic water quality criterion for aluminum was exceeded in 90% of the Spencer Brook samples. The most recent sample shows a much lower concentration than previous samples, but there is no known reason for this result. The lower concentration cannot be considered a trend based on a single data point.

Weston & Sampson, the contract operator of the treatment plant, has indicated that it decreased the amount of aluminum used for phosphorus removal during 2009. This is the cause of the significantly reduced effluent concentration seen in the monitoring data.

Based on the Spencer Brook data it is clear that the aluminum concentration upstream of the discharge has regularly exceeded the applicable chronic water quality criteria. The treatment plant discharge data shows that the effluent concentration has also exceeded the chronic criteria, although the most recent data has shown a reduction in concentrations due to operational modification at the facility.

The Massachusetts Water Quality Standards state that "[t]he Department will limit or prohibit discharges of pollutants to surface waters to assure that surface water quality standards of the receiving waters are protected and maintained or attained" and that " [i]n establishing water quality based effluent limitations the Department shall take into consideration natural background conditions and existing discharges" (314 CMR 4.03(1)(a)).

Accordingly, a monthly average effluent limit of 87 µg/l has been included in the draft permit to ensure that the discharge does not cause or contribute to a violation of Massachusetts Water Quality Standards. Monitoring frequency is once per month.

In the event that subsequent sampling shows that aluminum levels in Spencer Brook and in the discharge are less than the chronic criteria, the permittee may request a modification of the

effluent limit. EPA believes that at least four instream samples and twelve effluent samples (one year of data) would be the minimum number of samples necessary to support such a modification request.

D) Ammonia Nitrogen

High levels of ammonia in the water column can be toxic to fish by making it more difficult for fish to excrete this chemical via passive diffusion from gill tissues. Ammonia toxicity varies with pH and temperature. Ammonia can also lower dissolved oxygen levels by conversion to nitrate/nitrate, which consumes oxygen.

The current permit limits of 1.0 mg/l monthly average and 1.5 mg/l daily maximum, which are in effect from May through October were developed to protect the receiving water from dissolved oxygen impacts. These limits are more stringent than the toxicity based criterion, which is 3.65 mg/l (based on pH 7.0 and 22ºC; see the *1999 Update of Ambient Water Quality Criteria for Ammonia; EPA-822-R-99-014*

During 2007 – 2010, Middlesex School violated its permit limit four times, twice during August 2008, once in September 2008, and once in June 2009. According to Weston & Sampson, the August exceedances were due to operator error and the September exceedances were caused by deterioration of the treatment membrane.

The need for a winter ammonia limit was evaluated in fact sheet for the current (2005) permit. A criterion of 6.29 mg/l, based on a pH of 6.8 and temperature 0° C was selected to be protective of the river in all cold weather conditions. A protective limit was then identified by multiplying the instream criteria by the "winter" flow dilution factor (19). The design flow dilution was based on the 30Q10 (low flow for thirty days over a ten year period between November to April) of 1.55 cfs and the design flow of the facility of 0.08 cfs (0.052 MGD). The effluent limit would therefore be 6.29 x 19 = 120 mg/l, which far exceeded the ammonia concentration measured in the discharge. Therefore, the final permit did not include winter limits for ammonia; however, the permittee was required to report ammonia concentrations during the months of November through April. The ammonia concentrations discharged from the facility during the winter months remain far less than the protective limit identified in the fact sheet for the 2005 permit.

The draft permit therefore carries forward the seasonal ammonia nitrogen limits from the current permit. From May 1 to October, the monthly average limit is 1 mg/l and the maximum daily limit is 1.5 mg/l. The permittee must report average monthly and maximum daily ammonia nitrogen from the months of November through April.

E) Copper

Certain metals, including copper, can be toxic to aquatic life. The current permit requires monthly monitoring for copper. An examination of Middlesex School's data from 2007-2010 indicates that effluent copper concentrations range from non-detect to 57 µg/l (see Appendix A).

The *National Recommended Water Quality Criteria*: *2002* (US EPA 2002 [EPA-822-R-02-047]) includes copper criteria for the protection of aquatic life. These criteria are hardness-based.

Hardness data used to calculate the copper criteria below are from Middlesex School's Whole Effluent Toxicity (WET) test reports from March 2005 through December 2007. The hardness values used in this calculation are the median hardness values measured in the treatment plant discharge and the upstream receiving water during this period. For unknown reasons, Middlesex School has not measured Spencer Brook or effluent for hardness since December 2007. The updated toxicity testing protocol, Attachment A to the draft permit, continues the requirement to test both Spencer Brook and the facility effluent for hardness during quarterly WET tests.

Hardness Analysis

Where

C_r	=	Concentration below outfall		
Q_d	=	Discharge flow	=	0.052 MGD
C_d	=	Discharge concentration	=	88 mg/l
Q_s	=	Upstream flow	=	0.071 MGD
C_s	=	Upstream concentration	=	30 mg/l
Q_r	=	Streamflow below outfall (effluent + upstream)	=	0.123 MGD

Therefore,

$$C_r = \frac{(0.052\ \text{MGD} \times 88\ \text{mg/l}) + (0.071\ \text{MGD} \times 30\ \text{mg/l})}{0.123\ \text{MGD}}$$

$$= 54\ \text{mg/l}$$

1. Acute Criteria (Total Recoverable) = $\exp\{m_a [\ln(h)] + b_a\}$ = **7.83 µg/l**

Where:

m_a = Pollutant-specific coefficient	= 0.9422
b_a = Pollutant-specific coefficient	= -1.700
ln = Natural logarithm	
h = hardness of the receiving water	= 54 mg/l

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2. Chronic Criteria (Total Recoverable) = $\exp\{m_c [\ln(h)] + b_c\}$ = **5.51 µg/l**

Where:

m_c = Pollutant-specific coefficient	= 0.8545
b_c = Pollutant-specific coefficient	= -1.702
ln = Natural logarithm	
h = hardness of the receiving water	= 54 mg/l

The current permit requires monthly effluent copper monitoring, and EPA used this information to perform a Reasonable Potential Analysis to determine the potential for discharges of copper from the Middlesex WWTP to cause or contribute to an excursion above water quality criteria. First, EPA projected the maximum effluent concentration as 43.7 µg/l by calculating the 99th percentile measurement the effluent data from January 2008 through October 2010. EPA then calculated the 95th percentile concentration, 34.6 µg/l, to characterize the maximum monthly average concentration (see Appendix C).

Reasonable Potential Analysis for Copper – Chronic

Where

C_r	=	Concentration below outfall		
Q_d	=	Discharge flow	=	0.052 MGD
C_d	=	Discharge concentration	=	34.6 µg/l
Q_s	=	Upstream flow	=	0.071 MGD
C_s	=	Upstream concentration	=	2 µg/l
Q_r	=	Streamflow below outfall (effluent + upstream)	=	0.123 MGD

Therefore,

$$Cr = \frac{(0.052\ MGD \times 34.6\ \mu g/l) + (0.071\ MGD \times 2\ \mu g/l)}{0.123\ MGD}$$

= **15.8 µg/l** > 5.3 µg/l (chronic criterion)

Therefore, there is **reasonable potential** for the discharge to cause or contribute to an excursion from the chronic water quality criterion for copper.

Reasonable Potential Analysis for Copper – Acute

Where

C_r	=	Concentration below outfall		
Q_d	=	Discharge flow	=	0.052 MGD
C_d	=	Discharge concentration	=	43.7 µg/l
Q_s	=	Upstream flow	=	0.071 MGD
C_s	=	Upstream concentration	=	2 µg/l
Q_r	=	Streamflow below outfall (effluent + upstream)	=	0.123 MGD

Therefore,

$$Cr = \frac{(0.052\ MGD \times 43.7\ \mu g/l) + (0.071\ MGD \times 2\ \mu g/l)}{0.123\ MGD}$$

= **19.6 µg/l** > 7.83 µg/l (acute criterion)

Therefore, there is **reasonable potential** for the discharge to cause or contribute to an excursion from the acute water quality criterion for copper.

Background concentrations of copper in Spencer Brook were determined from the median of the WET Chemistry dilution water samples from September 2008 through June 2010. Pollutant levels were then inserted into a steady-state mixing equation to determine if the the projected discharge could cause or contribute to an excursion from water quality criteria under critical conditions.

As shown in the boxes below, the projected maximum copper effluent of 43.7 µg/l results in a downstream receiving water concentration of 19.6 µg/l during critical conditions, exceeding the acute criterion of 7.8 µg/l. A concentration of 34.6 µg/l, the 95th percentile concentration, results in a receiving water concentration of 15.8 µg/l, above the chronic criterion of 5.5 µg/l. Therefore, there is reasonable potential for the discharge to cause or contribute to an excursion of both the acute and chronic water quality standards for copper (see next page).

Maximum Daily Copper Limit

$$C_d = \frac{(Q_r C_r - Q_s C_s)}{Q_d}$$

Where

C_d	=	Discharge concentration	=	?
C_r	=	Concentration below outfall	=	7.83 µg/l (acute criterion)
Q_d	=	Discharge flow	=	0.052 MGD
Q_s	=	Upstream flow	=	0.071 MGD
C_s	=	Upstream concentration	=	2 µg/l
Q_r	=	Streamflow below outfall (effluent + upstream)	=	0.123 MGD

$$C_d = \frac{(0.123 \text{ MGD})(7.8 \text{ µg/l}) - (0.071 \text{ MGD})(2 \text{ µg/l})}{0.052 \text{ MGD}}$$

$$= 16 \text{ µg/l}$$

Monthly Average Copper Limit

$$C_d = \frac{(Q_r C_r - Q_s C_s)}{Q_d}$$

Where

C_d	=	Discharge concentration	=	?
C_r	=	Concentration below outfall	=	5.51 µg/l (chronic criterion)
Q_d	=	Discharge flow	=	0.052 MGD
Q_s	=	Upstream flow	=	0.071 MGD
C_s	=	Upstream concentration	=	2 µg/l
Q_r	=	Streamflow below outfall (effluent + upstream)	=	0.123 MGD

$$C_d = \frac{(0.123 \text{ MGD})(5.51 \text{ µg/l}) - (0.071 \text{ MGD})(2 \text{ µg/l})}{0.052 \text{ MGD}}$$

$$= 10 \text{ µg/l}$$

Effluent limitations were then calculated which would result in attainment of the water quality criteria downstream of the facility. The limits were calculated using the same steady state model that was used in determining reasonable potential, but setting the downstream concentration equal to the applicable water quality criteria and solving for the effluent concentration.

The draft permit therefore includes a maximum daily copper limit of 16 µg/l, and an average monthly limit of 10 µg/l. The proposed monitoring frequency is once per month. If the facility monitors at this frequency, the single sample must be reported as both the monthly average and the daily maximum. If Middlesex School chooses to sample more often than once per month, the average of the samples must be reported as the monthly average, and the highest sample during the month reported as the daily maximum.

F) Outfall 001 – Whole Effluent Toxicity

Under Section 301(b)(1)(C) of the CWA, discharges are subject to effluent limitations based on water quality standards. The Massachusetts Surface Water Quality Standards include the following narrative statement and require that EPA criteria established pursuant to Section 304(a)(1) of the CWA be used as guidance for interpretation of the following narrative criteria: All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife.

National studies conducted by the EPA have demonstrated that domestic sources contribute toxic constituents to POTWs. These constituents include metals, chlorinated solvents, aromatic hydrocarbons and others. Based on the potential for toxicity from domestic sources, the state narrative water quality criterion, the limited dilution at the discharge location, and in accordance with EPA national and regional policy and 40 C.F.R.§ 122.44(d), the draft permit includes whole effluent chronic and acute toxicity limitations (C-NOEC ≥ 42% and LC50≥100%). (See also "Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants", 49 Fed. Reg. 9016 March 9, 1984, and EPA's "Technical Support Document for Water Quality-Based Toxics Control", September, 1991.)

The draft permit carries forward the requirements for quarterly Chronic and Acute toxicity tests using the species *Ceriodaphnia dubia*, only. The tests must be performed in accordance with the test procedures and protocols specified in **Permit Attachment A**. The tests will be conducted four times a year, during the following months: March, June, September and December.

The LC_{50} limit of ≥100% is established by EPA/MassDEP policy for facilities with less than 10:1 dilution (See MassDEP's "Implementation Policy for the Control of Toxic Pollutants in Surface Waters, February 23, 1990). The C-NOEC is established at the receiving water concentration (1/Dilution Factor = 1/2.4), which is 42%.

VI. OPERATION AND MAINTENANCE OF THE COLLECTION SYSTEM

The permit standard conditions for 'Proper Operation and Maintenance' are found at 40 CFR §122.41(e). These require proper operation and maintenance of permitted wastewater systems and related facilities to achieve permit conditions. Similarly, the permittee has a 'duty to mitigate' as stated in 40 CFR §122.41 (d). This requires the permittee to take all reasonable steps to minimize or prevent any discharge in violation of the permit which has a reasonable likelihood

of adversely affecting human health or the environment. EPA and MassDEP maintain that an I/I removal program is an integral component to insuring permit compliance under both of these provisions.

The draft permit includes requirements for the permittee to control infiltration and inflow (I/I). Infiltration/inflow is extraneous water entering the wastewater collection system through a variety of sources. The permittee shall develop an I/I removal program commensurate with the severity of the I/I in the collection system. Where portions of the collection system have little I/I, the control program will logically be scaled down.

VII. SLUDGE INFORMATION AND REQUIREMENTS

The Middlesex School treatment facility has an aerobic digester for its waste sludge. Digested sludge is trucked to the either Fitchburg East WWTF, Taunton WWTP, or Wayland-Sudbury Septage Treatment Facility for final treatment and disposal.

In February 1993, the Environmental Protection Agency (EPA) promulgated standards for the use and disposal of sewage sludge. The regulations were promulgated under the authority of §405(d) of the Clean Water Act (CWA). Section 405(f) of the CWA requires that these regulations be implemented through permits. This permit is intended to implement the requirements set forth in the technical standards for the use and disposal of sewage sludge, commonly referred to as the Part 503 regulations.

Section 405(d) of the CWA requires that sludge conditions be included in all municipal permits. The sludge conditions in the draft permit satisfy this requirement and are taken from EPA's proposed Standards for the Disposal of Sewage Sludge to be codified at 40 CFR Part 503 (February 19, 1993 - Volume 58, pp 9248-9415). These conditions are outlined in the draft permit.

VIII. ESSENTIAL FISH HABITAT

Under the 1996 Amendments (PL 104-267) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq. (1998)), EPA is required to consult with the National Marine Fisheries Services (NMFS) if EPA's action or proposed actions that it funds, permits, or undertakes; may adversely impact any essential fish habitat as: waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. § 1802 (10)). Adversely impact means any impact which reduces the quality and/or quantity of EFH (50 C.F.R. § 600.910 (a)). Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

Essential fish habitat (EFH) is only designated for species for which federal fisheries management plans exist (16 U.S.C. § 1855(b) (1) (A)). EFH designations for New England were approved by the U.S. Department of Commerce on March 3, 1999.

The Middlesex School treatment facility discharges to Spencer Brook, which is a tributary of the Assabet River. The Assabet joins with the Sudbury River to form the Concord River, which ultimately drains into the Merrimack River. The Merrimack River system has been designated

as EFH for Atlantic salmon. Although EFH has been designated for this general location, EPA has concluded that this activity is not likely to affect EFH or its associated species for the following reasons:

- The quantity of the discharge from the WWTP is 0.052 MGD and the effluent receives advanced treatment;
- The facility withdraws no water from Spencer Brook; therefore no life stages of Atlantic salmon are vulnerable to impingement or entrainment from this facility;
- Limits specifically protective of aquatic organisms have been established for phosphorus, aluminum, chlorine and copper, based on EPA water quality criteria;
- Middlesex School WWTP disinfects with ultra-violet radiation; therefore no chlorine is used at the facility.
- Acute and chronic toxicity testing on *Ceriodaphnia dubia* is required four (4) times per year.
- The permit prohibits any violation of state water quality standards.

EPA believes that the conditions and limitations contained within the draft permit adequately protect all aquatic life, including those species with EFH designation. Impacts associated with issuance of this permit to the EFH species, their habitat and forage, have been minimized to the extent that no significant adverse impacts are expected. Further mitigation is not warranted.

IX. ENDANGERED SPECIES ACT

Section 7(a) of the Endangered Species Act of 1973, as amended (ESA) grants authority to and imposes requirements upon Federal agencies regarding endangered or threatened species of fish, wildlife, or plants ("listed species") and habitat of such species that has been designated as critical (a "critical habitat"). The ESA requires every Federal agency, in consultation with and with the assistance of the Secretary of Interior, to insure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The United States Fish and Wildlife Service (USFWS) typically administers Section 7 consultations for bird, terrestrial, and freshwater aquatic species. The National Marine Fisheries Service (NMFS) typically administers Section 7 consultations for marine species and anadromous fish.

EPA has reviewed the federal endangered or threatened species of fish and wildlife to determine if any listed species might potentially be impacted by the re-issuance of this NPDES permit. The review revealed that one federally protected species, the small whirled pogonia (*Isotria medeoloides*), an orchid, merited further discussion.

The small whirled pogonia orchid has been identified in Groton, Massachusetts, which is three towns away from the Middlesex School. In addition, the small whorled pogonia is found in "forests with somewhat poorly drained soils and/or a seasonally high water table," according to the USFWS website. This species is not aquatic; therefore it is unlikely that it would come into contact with the facility discharge.

EPA is coordinating a review of this finding with USFWS and NMFS through the Draft Permit

and Fact Sheet, and consultation under Section 7 of the ESA with USFWS and NMFS is not required.

X. MONITORING AND REPORTING

The effluent monitoring requirements have been established to yield data representative of the discharge under authority of Section 308 (a) of the CWA in accordance with 40 CFR §§122.41 (j), 122.44 (l), and 122.48.

The Draft Permit includes new provisions related to Discharge Monitoring Report (DMR) submittals to EPA and the State. The Draft Permit requires that, no later than one year after the effective date of the permit, the permittee submit all monitoring data and other reports required by the permit to EPA using NetDMR, unless the permittee is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs and reports ("opt-out request").

In the interim (until one year from the effective date of the permit), the permittee may either submit monitoring data and other reports to EPA in hard copy form, or report electronically using NetDMR.

NetDMR is a national web-based tool for regulated Clean Water Act permittees to submit discharge monitoring reports (DMRs) electronically via a secure Internet application to U.S. EPA through the Environmental Information Exchange Network. NetDMR allows participants to discontinue mailing in hard copy forms under 40 CFR § 122.41 and § 403.12. NetDMR is accessed from the following url: http://www.epa.gov/netdmr. Further information about NetDMR, including contacts for EPA Region 1, is provided on this website.

EPA currently conducts free training on the use of NetDMR, and anticipates that the availability of this training will continue to assist permittees with the transition to use of NetDMR. To participate in upcoming trainings, visit http://www.epa.gov/netdmr for contact information for Massachusetts.

The Draft Permit requires the permittee to report monitoring results obtained during each calendar month using NetDMR, no later than the 15th day of the month following the completed reporting period. All reports required under the permit shall be submitted to EPA as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA and will no longer be required to submit hard copies of DMRs to MassDEP. However, permittees must continue to send hard copies of reports other than DMRs to MassDEP until further notice from MassDEP.

The Draft Permit also includes an "opt-out" request process. Permittees who believe they cannot use NetDMR due to technical or administrative infeasibilities, or other logical reasons, must demonstrate the reasonable basis that precludes the use of NetDMR. These permittees must submit the justification, in writing, to EPA at least sixty (60) days prior to the date the facility would otherwise be required to begin using NetDMR. Opt-outs become effective upon the date of written approval by EPA and are valid for twelve (12) months from the date of EPA approval. The opt-outs expire at the end of this twelve (12) month period. Upon expiration, the permittee

must submit DMRs and reports to EPA using NetDMR, unless the permittee submits a renewed opt-out request sixty (60) days prior to expiration of its opt-out, and such a request is approved by EPA.

Until electronic reporting using NetDMR begins, or for those permittees that receive written approval from EPA to continue to submit hard copies of DMRs, the Draft Permit requires that submittal of DMRs and other reports required by the permit continue in hard copy format. Hard copies of DMRs must be postmarked no later than the 15th day of the month following the completed reporting period.

XI. STATE PERMIT CONDITIONS

The NPDES Permit is issued jointly by the U. S. Environmental Protection Agency and the Massachusetts Department of Environmental Protection under federal and state law, respectively. As such, all the terms and conditions of the permit are, therefore, incorporated into and constitute a discharge permit issued by the MassDEP Commissioner.

XII. STANDARD CONDITIONS

The standard conditions of the permit are based on 40 CFR Parts 122, Subparts A and D and 40 CFR 124, Subparts A, D, E, and F and are consistent with management requirements common to other permits.

XIII. STATE CERTIFICATION REQUIREMENTS

The staff of the Massachusetts Department of Environmental Protection ("MassDEP") has reviewed the draft permit. EPA has requested permit certification by the State pursuant to 40 CFR Part 124.53 and expects that the draft permit will be certified.

XIV. PUBLIC COMMENT PERIOD AND PROCEDURES FOR FINAL DECISION

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, to the U.S. EPA, Office of Ecosystem Protection, 5 Post Office Square, Suite 100, Boston, Massachusetts 02109-3912. Any person, prior to such date, may submit a request in writing for a public hearing to consider the draft permit to EPA and the State Agency. Such requests shall state the nature of the issues proposed to be raised in the hearing. Public hearings may be held after at least thirty days public notice whenever the Regional Administrator finds that response to this notice indicates a significant public interest. In reaching a final decision on the draft permit, the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston office.

Following the close of the comment period and after a public hearing, if such a hearing is held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice.

XV. EPA & MASSDEP CONTACTS

Additional information concerning the draft permit may be obtained between the hours of 9:00 a.m. and 5:00 p.m., Monday through Friday, excluding holidays from:

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kathleen.keohane@state.ma.

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Date

Stephen Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

Appendix A
Effluent Characteristics, November 2005 - November 2008

Month	Flow	Effluent Dissolved Oxygen, monthly avg	Downstream Dissolved Oxygen, monthly avg	BOD, monthly avg	BOD, weekly avg	BOD, daily max	BOD, avg monthly	BOD, avg weekly	pH min	pH max	TSS, avg monthly	TSS, avg weekly	TSS, max daily	TSS, avg monthly
	MGD	mg/l	mg/l	mg/l	mg/l	mg/l	lbs/day	lbs/day	s.u.	s.u.	mg/l	mg/l	mg/l	lbs/day
Jul-07	0.013	8.03	7.72	2	2	2	0.26	0.37	6.92	8.17	2.00	2.00	2.00	0.26
Aug-07	0.01	7.19	7.47	2.6	4.4	4.4	0.2	0.25	7.19	8.51	10.20	34.00	34.00	0.99
Sep-07	0.0167	7.5175	7.51	5.2	7.9	7.9	0.6	0.72	7.10	8.30	3.80	5.90	5.90	0.47
Oct-07	0.02	7.376667	7.38	3.2	6.3	6.3	0.53	0.88	6.94	8.31	2.30	3.00	3.00	0.4
Nov-07	0.021			0	0	0	0.29	0.46	6.97	8.03	0.00	2.30	2.30	0.3
Dec-07	0.015			2.35	3.4	3.4	0.22	0.29	6.96	8.92	2.25	2.70	2.70	0.23
Jan-08	0.031			2.4	4	4	0.55	0.85	6.57	8.00	2.00	2.00	2.00	0.46
Feb-08	0.049			2.1	2.6	2.6	0.86	1.63	6.75	7.68	2.35	3.10	3.10	0.91
Mar-08	0.036			2	2	2	0.52	0.67	6.59	7.54	2.40	3.70	3.70	0.58
Apr-08	0.03	7.5525		2.2	3	3	0.59	0.69	6.48	7.53	4.30	5.00	5.00	1.2
May-08	0.026	7.551667		4	12	12	0.75	1.99	6.60	7.54	2.00	2.00	2.00	0.42
Jun-08	0.012	7.57	6.23	0	0	0	0.19	0.19	6.69	7.93	0.00	0.00	<2	0.19
Jul-08	0.01365	DNA	5.44	3.4	5.1	5.1	0.46	0.67	6.08	9.94	2.10	2.70	2.70	0.3
Aug-08	0.0152	7.114286	4.89	2.9	5.7	5.7	0.4	0.99	6.83	8.14	6.10	8.70	8.70	0.76
Sep-08	0.028	6.746667	5.03	3.3	7.2	7.2	0.69	1.29	6.48	8.14	4.42	9.30	9.30	0.93
Oct-08	0.028	8.034286	7.37	2.2	3	3	0.57	0.78	6.20	7.46	2.00	2.20	2.20	0.53
Nov-08	0.024			2	2	2	0.37	0.43	6.52	8.01	2.20	2.70	2.70	0.4
Dec-08	0.037			2	2	2	0.6	0.8	6.29	7.85	2.10	2.30	2.30	0.6
Jan-09	0.03			2.5	3.3	3.3	0.55	0.84	6.86	8.09	2.40	3.20	3.20	0.53
Feb-09	0.031			2.5	4.7	4.7	0.6	1.53	6.44	7.43	2.60	3.70	3.70	0.61
Mar-09	0.022			2	2	2	0.25	0.52	6.51	7.62	3.10	7.50	7.50	0.53
Apr-09	0.031	8.026667		2.4	3.8	3.8	0.62	1.02	6.21	7.34	2.00	2.00	2.00	0.5
May-09	0.027	6.94		4.5	11	11	1.2	3.6	6.53	7.25	2.00	2.00	2.00	0.4
Jun-09	0.013	7.581667	5.85	2	2	2	0.18	0.22	6.51	7.56	2.00	2.00	2.00	0.18
Jul-09	0.012	8.178	6.10	2.2	3	3	0.27	0.37	6.51	7.47	2.00	2.00	2.00	0.25
Aug-09	0.012	7.725	6.85	2	2	2	0.2	0.33	6.51	7.81	2.00	2.00	2.00	0.2
Sep-09	0.02	8.2675	6.41	2	2	2	0.35	0.44	6.52	8.13	2.00	2.00	2.00	0.35
Oct-09	0.022	7.704	6.45	3.1	5.4	5.4	0.6	0.9	6.51	7.93	2.00	2.00	2.00	0.4
Nov-09	0.023			2	2	2	0.39	0.52	6.52	6.97	2.00	2.00	2.00	0.39
Dec-09	0.026			2	2	2	0.45	0.57	6.55	7.98	2.00	2.00	2.00	0.45
Jan-10	0.031			2	2	2	0.5	0.6	6.69	8.24	2.00	2.00	2.00	0.5
Feb-10	0.035			3.8	5.4	5.4	1.5	3.7	6.58	7.39	2.00	2.00	2.00	0.71
Mar-10	0.035			2.8	3.6	3.6	0.7	1.3	6.58	7.23	2.00	2.00	2.00	0.5
Apr-10	0.031	5.6125		2	2	2	0.563	0.748	6.53	7.28	2.00	2.00	2.00	0.563
May-10	0.023	4.8425		2	2	2	0.423	0.522	6.51	7.44	2.00	2.00	2.00	0.423
Jun-10	0.011	5.3075	5.33	2	2	2	0.19	0.364	6.52	7.65	2.00	2.00	2.00	0.19
3/2005 Permit Limits	0.052	Report	Report	10	10	Report	4.3	4.3	6.5	8.3	10	15	Report	4.3
Minimum	0.01	4.8425	4.89	0	0	0	0.18	0.19	6.08	6.97	0	0	2	0.18
Average	0.024	7.2	6.4	2.4	3.7	3.7	0.5	0.9	6.6	7.9	2.5	3.8	3.9	0.5
Maximum	0.049	8.2675	7.72	5.2	12	12	1.5	3.7	7.19	9.94	10.2	34	34	1.2
Standard Deviation	0.009	1.0	1.0	1.0	2.6	2.6	0.3	0.8	0.2	0.5	1.7	5.5	5.6	0.2
# measurements	36	21	15	36	36	36	36	36	36	36	36	36	36	36
# exceed 2005 permit limit	0	N/A	N/A	0	2	N/A	0	0	7	4	1	1	0	0

highlight = exceeds permit limit
DNA = data not available
BOD = Biochemical Oxygen Demand
TSS = Total Suspended Solids
#/100 ml = number of bacterial colonies per 100 ml water
TRC = Total Residual Chlorine

Appendix A
Effluent Characteristics, November 2005 - November 2008

Month	TSS, avg weekly lbs/day	Ammonia, avg monthly mg/l	Ammonia, max daily mg/l	Total Phosphorus, avg monthly mg/l	Total Phosphorus, max daily mg/l	Copper, average monthly ug/l	TRC, monthly average mg/l	TRC, max daily mg/l	Fecal Coliform, geometric avg #/100 ml	Fecal Coliform, max daily #/100 ml
Jul-07	0.37	0.67	1.7	0.17	0.26	27	0.020	0.010	1	1
Aug-07	3.46	0.28	0.51	0.31	0.57	0	0.014	0.050	1	1
Sep-07	1.01	0.3	0.83	0.27	0.5	35	0.006	0.023	1	1
Oct-07	0.58	0.39	1.3	0.27	0.47	12	0.007	0.021	1	1
Nov-07	0.46	0.24	0.42	0.39	0.64	0	0.010	0.020	1	1
Dec-07	0.3	0.14	0.26	0.28	0.36	32	0.008	0.020	1	1
Jan-08	0.66	0.31	0.53	0.25	0.5	33	0.013	0.023	1	1
Feb-08	1.44	0.2	0.67	0.11	0.18	57	0.009	0.020	1	1
Mar-08	0.68	0.26	0.42	0.15	0.24	14	0.007	0.011	1	1
Apr-08	1.62	0.13	0.24	0.2	0.31	24	0.009	0.041	1	1
May-08	0.48	0.16	0.24	0.2	0.29	21	0.008	0.016	1	1
Jun-08	0.19	0.15	0.26	0.2	0.27	17	0.009	0.017	1	3
Jul-08	4.5	0.22	0.51	0.16	0.18	23	0.013	0.021	1	1
Aug-08	1.44	1.75	11	0.15	0.44	22	0.009	0.020	1	1
Sep-08	1.67	0.87	4.2	0.24	0.71	22	0.019	0.170	1	1
Oct-08	0.61	0.14	0.31	0.26	0.46	0	0.022	0.140	1	1
Nov-08	0.55	0.25	0.57	0.21	0.27	13	0.016	0.090	1	1
Dec-08	0.8	0.12	0.19	0.14	0.23	17	0.018	0.092	1	1
Jan-09	0.86	5.8	14	0.19	0.27	23	0.020	0.090	1	1
Feb-09	1.21	2.2	7	0.19	0.27	14	0.024	0.130	1	1
Mar-09	1.94	0.36	0.91	0.21	0.5	32	0.013	0.024	1	1
Apr-09	0.6	1.3	4.7	0.1	0.12	24	0.010	0.021	1	1
May-09	0.6	0.2	0.56	0.22	0.4	14	0.010	0.060	1	1
Jun-09	0.22	0.54	1.7	0.18	0.3	16	0.008	0.018	1	1
Jul-09	0.37	0.15	0.32	0.16	0.13	13	0.010	0.019	1	1
Aug-09	0.33	0.55	0.84	0.1	0.09	15	0.010	0.019	1	1
Sep-09	0.44	0.5	0.5	0.07	0.12	26	0.012	0.023	1	1
Oct-09	0.5	0.18	0.5	0.09	0.17	20	0.015	0.024	2.4	36
Nov-09	0.52	0.18	0.31	0.25	0.29	14	0.013	0.022	1	1
Dec-09	0.57	0.1	0.11	0.28	0.36	32	0.015	0.021	1	1
Jan-10	0.5	0.1	0.1	0.31	0.39	33	0.011	0.024	1	1
Feb-10	1.4	0.1	0.1	0.65	0.66	18	0.038	0.240	1.8	21
Mar-10	0.9	0.1	0.1	0.19	0.34	36	0.011	0.019	1	1
Apr-10	0.748	0.13	0.16	0.168	0.21	15	0.020	0.200	1	1
May-10	0.522	0.17	0.35	0.125	0.21	18	0.011	0.018	1	1
Jun-10	0.364	0.14	0.26	0.12	0.22	12	0.011	0.020	1	1
3/2005 Permit Limits	6.5	Varies	Varies	Varies	Report	Report	0.026	0.045	200	400
Minimum	0.19	0.1	0.1	0.07	0.09	0	0.006	0.01	1	1
Average	0.9	0.5	1.6	0.2	0.3	20.7	0.0	0.0	1.1	2.6
Maximum	4.5	5.8	14	0.65	0.71	57	0.038	0.24	2.4	36
Standard Deviation	0.9	1.0	3.1	0.1	0.2	11.2	0.0	0.1	0.3	6.6
# measurements	36	36	36	36	36	36	36	36	36	36
# exceed 2005 permit limit	0	1	2	3	N/A	N/A	1	10	0	0

highlight = exceeds permit limit
DNA = data not available
BOD = Biochemical Oxygen Demand
TSS = Total Suspended Solids
#/100 ml = number of bacterial colonies per 100 ml water
TRC = Total Residual Chlorine

Appendix B

Middlesex School
Dissolved Oxygen Readings

	Downstream DO	Effluent DO
5/1/2008	6.89	7.41
5/9/2008	7.51	6.94
5/14/2008	7.39	8.14
5/16/2008	7.34	8.31
5/22/2008	8.26	7.25
5/29/2008	6.39	7.26
6/7/2008	6.31	7.52
6/13/2008	7.41	7.62
6/19/2008	5.94	7.63
6/27/2008	5.26	7.51
8/7/2008	4.86	7.15
8/14/2008	4.96	6.83
8/21/2008	4.65	7.63
8/26/2008	5.16	8.14
8/28/2008	4.83	7.61
9/4/2008	4.97	6.84
9/11/2008	5.61	7.34
9/18/2008	4.69	6.94
9/25/2008	4.86	7.25
10/1/2008	5.61	7.34
10/8/2008	4.82	6.99
10/15/2008	8.26	7.15
10/22/2008	9.03	8.21
10/30/2008	9.51	8.52
4/3/2009	6.46	7.53
4/10/2009	5.67	6.98
4/17/2009	5.99	7.69
4/24/2009	9.64	8.16
5/1/2009	6.93	7.25
5/8/2009	7.05	6.59
5/13/2009	5.65	6.47
5/20/2009	7.35	7.13
5/29/2009	6.98	7.08
6/4/2009	5.94	7.23
6/12/2009	4.85	6.28
6/18/2009	6.57	7.59
6/24/2009	6.29	9.05
7/1/2009	6.93	7.89
7/8/2009	6.12	9.82
7/15/2009	6.89	8.59
7/24/2009	7.34	5.98
7/27/2009	4.17	8.61

Appendix B

8/6/2009	5.94	7.89
8/14/2009	6.21	7.46
8/20/2009	6.43	6.91
8/27/2009	5.05	8.64
9/3/2009	7.09	8.37
9/10/2009	6.94	8.51
9/17/2009	5.21	8.54
9/24/2009	6.94	7.65
10/1/2009	3.65	7.75
10/8/2009	4.97	7.49
10/15/2009	8.34	7.65
10/22/2009	9.09	7.94
10/28/2009	6.37	7.69
4/8/2010	4.05	6.02
4/14/2010	5.71	5.81
4/20/2010	5.91	5.81
4/29/2010	6.67	4.81
5/5/2010	4.24	4.81
5/12/2010	5.52	5.42
5/20/2010	4.45	5.16
5/26/2010	4.08	3.98
6/3/2010	3.98	4.98
6/10/2010	4.17	5.02
6/16/2010	5.05	5.78
6/29/2010	3.85	5.45
7/7/2010	3.23	5.36
7/16/2010	4.31	5.28
7/22/2010	3.39	5.41
7/29/2010	4.32	4.47
8/2/2010	4.43	5.52
8/10/2010	3.13	5.12
8/26/2010	4.17	5.4
9/1/2010	2.43	5.33
9/8/2010	2.98	5.45
9/15/2010	4.46	5.32
9/23/2010	3.13	5.34
9/29/2010	4.01	5.14

Appendix C

Copper Statistical Analysis

Copper RP Analysis

non-detect, >10 samples

Date	Cu* (ug/l)	lnCu (ug/l)	$(y_i - u_y)^2$	# samples per month
Jan-08	18	2.8904	0.0043922	1
Feb-08	57	4.0431	1.1802769	1
Mar-08	14	2.6391	0.1008624	1
Apr-08	24	3.1781	0.0490215	1
May-08	21	3.0445	0.0077223	1
Jun-08	17	2.8332	0.0152356	1
Jul-08	23	3.1355	0.0319868	1
Aug-08	22	3.0910	0.0180625	1
Sep-08	22	3.0910	0.0180625	1
Oct-08	0			1
Nov-08	13	2.5649	0.1534261	1
Dec-08	17	2.8332	0.0152356	1
Jan-09	23	3.1355	0.0319868	1
Feb-09	14	2.6391	0.1008624	1
Mar-09	32	3.4657	0.2591727	1
Apr-09	24	3.1781	0.0490215	1
May-09	14	2.6391	0.1008624	1
Jun-09	16	2.7726	0.033877	1
Jul-09	13	2.5649	0.1534261	1
Aug-09	15	2.7081	0.0617998	1
Sep-09	26	3.2581	0.0908726	1
Oct-09	20	2.9957	0.0015278	1
Nov-09	14	2.6391	0.1008624	1
Dec-09	32	3.4657	0.2591727	1
Jan-10	33	3.4965	0.2914507	1
Feb-10	18	2.8904	0.0043922	1
Mar-10	36	3.5835	0.3929699	1
Apr-10	15	2.7081	0.0617998	1
May-10	18	2.8904	0.0043922	1
Jun-10	12	2.4849	0.2225378	1
Jul-10	28	3.3322	0.1410444	1
Aug-10	16	2.7726	0.033877	1
Sep-10	10	2.3026	0.4277954	1
Oct-10	10	2.3026	0.4277954	1

min	0
max	57

Appendix C

Copper Statistical Analysis

Daily Maximum Concentration - 99th percentile (some measurements < detection limit)

Detection Limit** =		0.003
u_y = Avg of Nat. Log of daily Discharge (mg/L) =		2.95665
$\Sigma (y_i - u)^2$ =		4.84578
k = number of daily samples =		34
r = number of non-detects =		1
σ_y^2 = estimated variance = $(\Sigma[(y_i - u_y)^2]) / (k-r-1)$ =		0.15143
σ_y = standard deviation = square root σ_y^2 =		0.38914
δ = number of nondetect values/number of samples =		0.02941
z=z-score[$(0.99-\delta)/(1-\delta)$] =	z-score of	0.98970
	=	2.108358

(determine z at http://www.fourmilab.ch/rpkp/experiments/analysis/zCalc.html)

RP analysis/Limit calculation:

99th percentile daily max limit = exp (u_y + z-score*σ_y)

Daily Max Limit * = 43.69 ug/l

TSD-Table E-1, 99th percentile with ND

Average Monthly Concentration - 95th percentile (some measurements < detection limit)

Number of samples per month, n =	1
E(x) = Daily Avg = exp(u_y + 0.5 σ_y^2) =	20.74616
V(x) = Daily Variance = exp(2u_y + σ_y^2) * [exp(σ_y^2) - 1] =	70.3699261

E(Xn) = E(x)
V(Xn) = V(x)/n

RP analysis/Limit calculation:

95th percentile monthly average limit = E(Xn) + 1.645[V(Xn)]^(1/2)

Monthly Avg Limit* = 34.55 ug/l

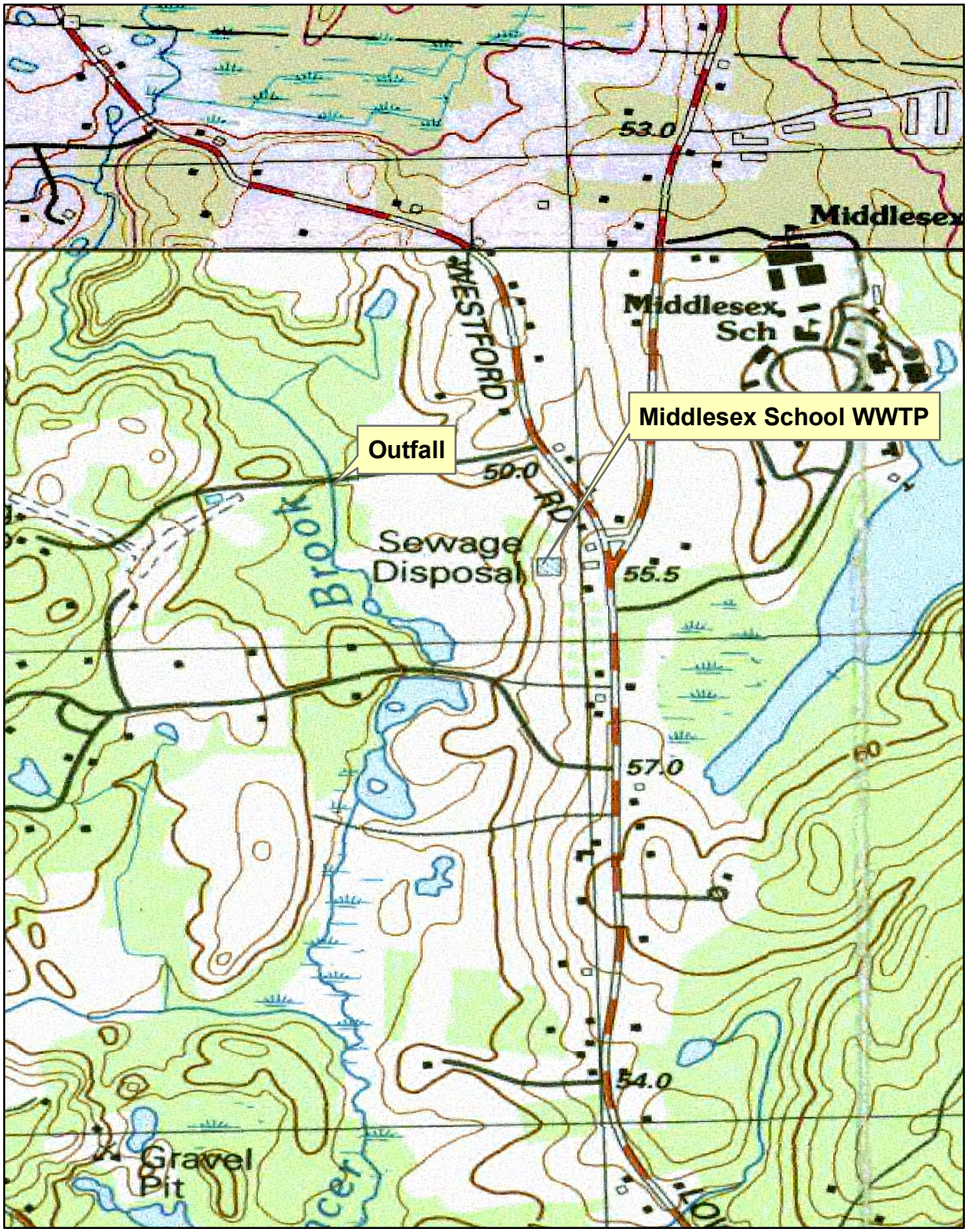
TSD-Table E-3, 95th percentile

***Take dilution and ambient conc into consideration to determine potential conc after mix, if conc after mix > criteria, then RP exists**

**detection limit =0.003

***TSD Table 3-1

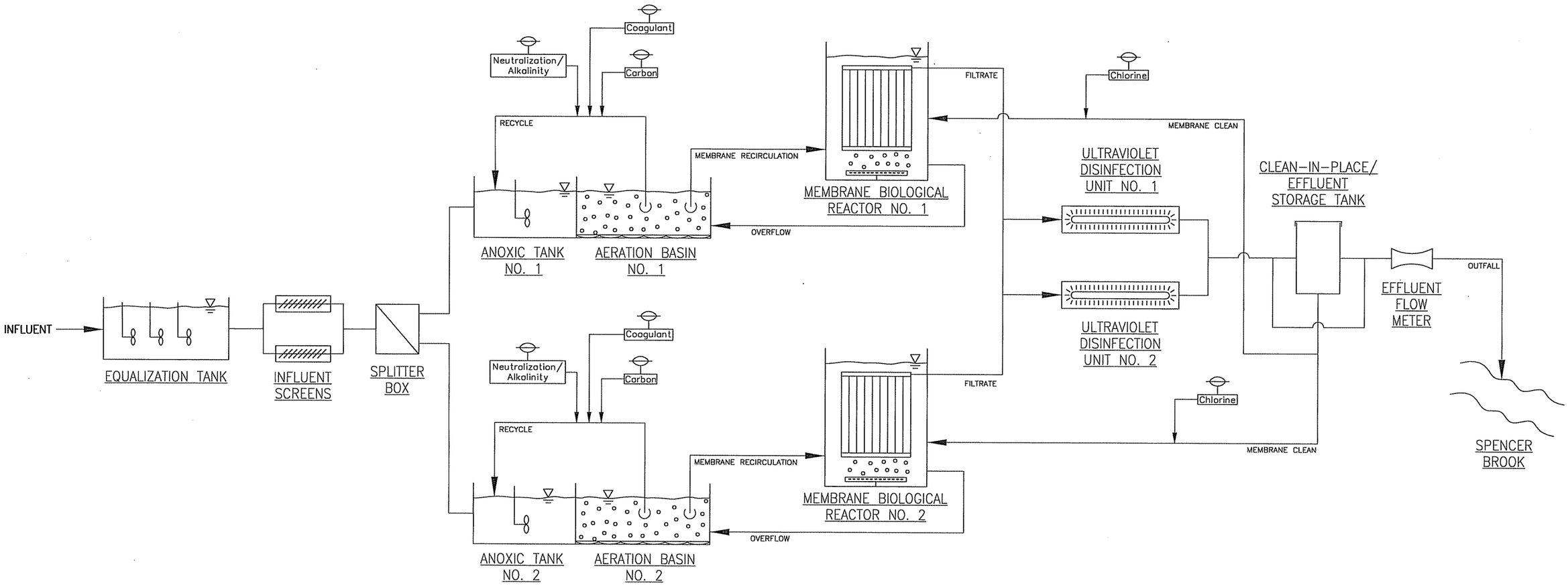
****TSD Table 3-2



1 in = 1,000 ft

Figure 1
Middlesex School WWTP
Location Map

Figure 2 - WWTP Schematic



LEGEND

- FLOW ELEMENT
- Chemical — CHEMICAL FEED PUMP
- SUBMERSIBLE MIXER
- AERATION GRID

MIDDLESEX SCHOOL
CONCORD, MASSACHUSETTS

MIDDLESEX WASTEWATER TREATMENT FACILITY
FLOW SCHEMATIC

DESIGNED BY: HBD	CHECKED BY: CMP	DATE: AUGUST 2010

Weston&Sampson®

C:\Documents and Settings\bennetth\Desktop\Middlesex School WWTF Flow Schematic.dwg

Middlesex School (Permit No. MA0102466) – Response to Comments

On August 2, 2011, the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) released for public notice a Draft Permit (MA0102466) for the Middlesex School Wastewater Treatment Facility (WWTF).

EPA received comments from the Organization for the Assabet, Sudbury and Concord Rivers (OARS) and the Sudbury, Assabet, and Concord (SuAsCo) Wild and Scenic River Stewardship Council. The comments are presented verbatim below, with responses. No changes to the permit were made as a result of the comments.

I. Changes to the Permit:

a. The following text was added to Footnote 2 of the permit to clarify monitoring and reporting requirements: "Report annual average, monthly average, and the maximum daily flow."
b. In Footnote 7, paragraph 3, the word "subsequent" was changed to "future."
c. Footnote 12 was clarified to define the chronic water quality criteria for aluminum as 87 μg/l and to specify that the type of sampling necessary for a modification of the aluminum permit limit is quarterly WET testing. Finally, the word "subsequent" was changed to "future."
d. On page 6 of the permit, the heading "Part I.A.1., (Continued)" was added after the footnotes.
e. A comma was removed from the third line of the second paragraph of Section I.E., Special Conditions.

II. Response to Comments

Comments received from Alison Field-Juma, of OARS.

OARS Comment #1: We are concerned…that the monitoring requirements of the 2005 permit have not always been observed, in particular the collection of hardness data for the WET analysis and the timing of dissolved oxygen monitoring.

Response: EPA agrees; thus the requirements have been carried into the new permit, and EPA highlighted this issue in the fact sheet to ensure that the permittee is fully aware of the data collection requirements. Failure to collect these data is a violation of the permit.

OARS Comment #2: Dissolved oxygen is a key predictor of negative impacts of nutrients on aquatic ecosystems. The monitoring data show that even at times when dissolved oxygen should be high, it has on occasion been depressed, indicating potential impacts. The treated effluent is discharged into a small stream (Spencer Brook) with several small impoundments not far downstream which may be impacted.

Response: EPA agrees that the dissolved oxygen data collected to date indicate low dissolved oxygen at a time of day when it should be high. Continued upstream and downstream sampling will be helpful to analyze this problem. The comment is now part of the public record.

OARS Comment #3: We strongly support the added monitoring and reporting requirements for dissolved oxygen and total residual chlorine in the draft permit compared with the 2005 permit which it replaces. When the source of the chlorine exceedances has been identified and eliminated, we agree that the TRC monitoring may no longer be needed.

Response #3: The comment is now part of the public record.

OARS Comment #4: OARS strongly supports the requirement for upstream and downstream monitoring of dissolved oxygen in order to understand the effect of the discharge.

Response #4: The comment is now part of the public record.

OARS Comment #5: We also strongly support the requirement for monthly upstream monitoring of total phosphorus from April through October to enable a more accurate calculation of the current upstream phosphorus loading.

Response #5: The comment is now part of the public record.

OARS Comment #6: Timing the phosphorus sampling to coincide with the upstream aluminum sampling is also sensible and efficient.

Response #6: The comment is now part of the public record.

OARS Comment #7: It is inherently difficult to manage a wastewater discharge to surface water, particularly to a tributary as small as Spencer Brook, and maintain the quality of the receiving water. In time we hope that the permittee will investigate the possibility of discharging treated effluent through a groundwater recharge system which will recharge the groundwater and support a cleaner base flow to Spencer Brook.

Response #7: EPA concurs that the limited dilution provided by Spencer Brook makes it critical that the treatment facility maintain compliance with the effluent limitations and conditions in the permit. EPA also concurs that discharge through a groundwater recharge system could provide further environmental benefits but believes that the effluent limitations and conditions in the permit are protective of water quality.

Comments received from Jamie Fosburg, SuAsCo Wild and Scenic River Stewardship Council (RSC).

RSC Comment #1: It is unfortunate to find the dissolved oxygen monitoring did not strictly adhere to the required timing and frequency of sampling contained in the current permit. The data that were collected show there are concerns about depleted oxygen in the receiving water even with sampling occurring at mid-day. The RSC supports the dissolved oxygen monitoring requirements in the draft permit given the information available on dissolved oxygen levels over the years.

Response #1: The comment is now part of the public record.

RSC Comment #2: The value gained by upstream measurements provides a strong argument for resolving any upstream access issues that may exist. The additional information will help regulators understand the river and wetland system.

Response #2: The comment is now part of the public record.

RSC Comment #3: The RSC understands and agrees with the timing of the sampling required in the current and draft permit. Capturing conditions closer to the daily worst and optimal dissolved oxygen levels is key to understanding the brook ecosystem and the river system stresses and root cause(s) of depressed dissolved oxygen concentrations.

Response #3: The comment is now part of the public record.

RSC Comment #4: The discharge monitoring data for this facility indicate some instances of elevated aluminum and copper concentrations in the effluent. The plant has worked to fine tune their application rate of alum and this effort is reducing effluent concentrations of aluminum. These efforts are admirable but it is premature to conclude that the lower effluent concentrations will be sufficient to meet standards. The RSC supports the continued monitoring of aluminum and copper concentrations in the effluent.

Response #4: The comment is now part of the public record.

RSC Comment #5: The RSC supports the ammonia limitation contained in the draft permit. As noted in the permit packet, the discharge data provided shows there is the potential for exceedances of acceptable concentrations. This potential warrants including a limit for ammonia.

Response #5: The comment is now part of the public record.

RSC Comment #6: Nutrients have been the primary concern in the mainstem Assabet River due to the many municipal wastewater discharges. The associated water quality impacts are well documented in the 2004 TMDL. Dischargers to the mainstem are investing in improved facilities with enhanced nutrient removal designed to meet stricter limits on phosphorus concentrations and loads. Other point sources in the SuAsCo

watershed have also seen marked reductions in phosphorus limits. Of particular pertinence to this draft permit is the Town of Wayland facility. The plant's phosphorus limit is 0.1 mg/l versus the Middlesex School's seasonal 0.2 mg/l. This facility, with a permitted discharge volume of 0.052 MGD, is of similar size to the Middlesex School and also treats domestic wastewater. It is unclear why there would be a difference in the nutrient requirements for two similar plants and the RSC advocates for a phosphorus limit on par with the Wayland permit barring any compelling reasons for the difference.

Response #6: It has been established that "[p]ermits are issued on an individual basis, taking into account individual differences as appropriate." *In re City of Attleboro*, NPDES Appeal Nos. 08-08 & 08-09, slip op. at 36 (EAB Sept. 15, 2009); *see also In re City of Port St. Joe*, 7 E.A.D. 275, 304 n.44 (EAB 1997). There are significant differences between this permit and the permit issued to the Town of Wayland for its publicly owned treatment works. Among these differences are (1) that the discharges are to different receiving waters with different characteristics, which are set forth in detail below, (2) that Wayland discharges directly to a Wild and Scenic River, while the Middlesex School discharges to a tributary of a Wild and Scenic River, and (3) that the Wayland discharge was a recommenced discharge, with questions related to antidegradation (specifically, whether a sufficient number of failing septic systems within the Town had been connected to the treatment plant to offset the pollutant loads authorized by the permit). In sum, these differences supported a more stringent effluent phosphorus limit in the Wayland permit than is necessary here.

Protection of Spencer Brook

The Middlesex School discharges to Spencer Brook, a tributary to the Assabet River. Calculations provided below show that the 0.2 mg/l limit is sufficiently stringent to ensure attainment of the Gold Book criteria of 0.1 mg/l instream provided that the background concentration does not exceed 27 µg/l, which is a typical value in a stream with a rural watershed.

Mass Balance Equation: $Q_rC_r = Q_dC_d + Q_sC_s$

Where

C_s	=	Upstream concentration	=	?
Q_s	=	Upstream flow	=	0.11 cfs
Q_d	=	Discharge flow	=	0.080 cfs (design flow)
C_d	=	Discharge concentration	=	200 µg/l (permit limit)
C_r	=	Concentration below outfall	=	100 µg/l (WQ criterion)
Q_r	=	Streamflow below outfall	=	0.19 cfs (effluent + upstream)

Therefore,

$$C_s = \frac{Q_rC_r - Q_dC_d}{Q_s}$$

$$C_s = \frac{(0.19 \text{ cfs} \times 100 \text{ µg/l}) - (0.080 \text{ cfs} \times 200 \text{ µg/l})}{0.11 \text{ cfs}}$$

$$= \mathbf{27 \text{ µg/l}}$$

This is a worst-case scenario that assumes Middlesex School discharges at its full design flow during the summer season. Because of reduced school population during the summer, however, the average discharge flow during the summer season (April-October) from 2007 through 2010 was 20,198 gallons per day (0.03 cfs), less than half of design flow. Under these conditions, the 0.2 mg/l limit is sufficiently stringent to ensure attainment of the Gold Book criteria instream provided that the background concentration does not exceed 72 µg/l (See calculations below).

Mass Balance Equation: $Q_rC_r = Q_dC_d + Q_sC_s$

Where

C_s	=	Upstream concentration	=	?
Q_s	=	Upstream flow	=	0.11 cfs
Q_d	=	Discharge flow	=	0.031 cfs (actual summer value)
C_d	=	Discharge concentration	=	200 µg/l (permit limit)
C_r	=	Concentration below outfall	=	100 µg/l (WQ criterion)
Q_r	=	Streamflow below outfall	=	0.141 cfs (effluent + upstream)

Therefore,

$$C_s = \frac{Q_rC_r - Q_dC_d}{Q_s}$$

$$C_s = \frac{(0.141 \text{ cfs} \times 100 \text{ µg/l}) - (0.031 \text{ cfs} \times 200 \text{ µg/l})}{0.11 \text{ cfs}}$$

$$= \mathbf{72 \text{ µg/l}}$$

This analysis provides additional confidence that the proposed limit is protective, especially in consideration of total phosphorus concentration measurements taken in Spencer Brook during 2007 (See table on page 6). These measurements show that phosphorus concentrations downstream of the Middlesex discharge averaged 52 ug/l during the summer of 2007.

The permit requires upstream phosphorus monitoring, which will be used to verify the upstream concentration. These data and the required instream dissolved oxygen monitoring will provide new information, which will be used to evaluate the sufficiency of the phosphorus limits.

Protection of the Assabet River

First, the phosphorus limit proposed in the draft permit is more stringent than the 0.5 mg/l limit for the facility included in the Assabet River TMDL for protection of water quality in the Assabet.

We have also reviewed data collected by the Organization for the Assabet River to estimate the impact of the Middlesex School discharge on phosphorus concentrations in the Assabet River. The table below compares instream phosphorus concentrations, as

reported by OARS[1], in Spencer Brook and the Assabet River upstream of Spencer Brook in 2007. This is the most recent year with data from both waters.

	Total Phosphorus, µg/l	
Date	**Assabet River at Route 2**	**Spencer Brook, downstream of Middlesex School**
6/16/2007	101	57
7/21/2007	60	53
8/18/2007	56	52
9/22/2007	47	46

The median phosphorus concentration in the Assabet River upstream of Spencer Brook in 2007 was 58 µg/l. The median phosphorus concentration in Spencer Brook downstream of Middlesex School in 2007 was 52.5 µg/l. On each sampling date, the phosphorus concentration in the Assabet River was higher than that of Spencer Brook. These data show that the influence from Spencer Brook would be to lower, rather than raise, phosphorus concentrations in the Assabet River. The following mass balance equation shows that the resulting phosphorus concentration during 7Q10 flow conditions would be about 57.9 µg/l, which is still well below the Gold Book criterion of 100 µg/l.

[1] from Appendix I of StreamWatch and Water Quality Monitoring Program, Final Report – 2007 & 2008 Field Seasons, Organization for the Assabet River.

Influence of Spencer Brook on Assabet River Phosphorus Concentrations

Where

C_r	=	Concentration in Assabet below confluence w/Spencer Brook		
Q_d	=	Spencer Brook 7Q10 flow	=	0.23 cfs
C_d	=	Spencer Brook concentration	=	52 µg/l
Q_r	=	Assabet River 7Q10 flow	=	17.4 cfs
C_s	=	Assabet stream concentration	=	58 µg/l
Q_s	=	Assabet 7Q10 flow downstream of confluence (Spencer Brook + Upstream Assabet flow)	=	17.63 cfs

Therefore,

$$C_r = \frac{(0.23 \text{ cfs} \times 52 \text{ µg/l}) + (17.4 \text{ cfs} \times 58 \text{ µg/l})}{17.63 \text{ cfs}}$$

$$= \mathbf{57.9 \text{ µg/l}}$$

Spencer Brook 7Q10 flow calculated using a flow factor of 0.02 cfs/sq mile, a tributary area of 7.51 sq miles (from Streamstats) and the design flow of the Middlesex School WWTP of 0.08 cfs. (0.02)(7.51) + 0.08 = 0.23 cfs.

Assabet River 7Q10 flow calculated using 7Q10 at Maynard gage (15.1 cfs) + plus dry weather discharge flow for the Maynard POTW (0.67 MGD, or 1 cfs, based on lowest monthly average flow over the past 5 years) plus watershed flow from the 53 square mile watershed between the Maynard gage and the confluence with Spencer Brook using a flow factor of 0.024 cfs/square mile (from Maynard NPDES permit fact sheet) 15.1 +1 +(53)(0.024) = 17.4 cfs

The calculation above also serves to show the minimal effect the discharge from Spencer Brook has on the Assabet River due to its low flow relative to the flow in the Assabet River. The dilution factor calculated using the Spencer Brook and Assabet River 7Q10 flows is about 77 [(17.4+0.23)/0.23], meaning that a mg/l of pollutant discharged from Spencer Brook will only change the concentration in the Assabet by about 0.013 mg/l (1/77).

Moreover, in 2007, when the OAR data was collected, Middlesex School's average effluent phosphorus concentration during the summer season was 248 µg/l, higher than the permit limit of 200 µg/l. One would expect phosphorus levels in Spencer Brook to be lower than those measured in 2007 if Middlesex School were meeting the phosphorus limit in their permit. Middlesex School has improved its phosphorus removal in subsequent years, with summer concentrations averaging 201 µg/l in 2008, 131 µg/l in 2009, and 109 µg/l in 2010 during the summer season.

RSC Comment #7: We fully support the requirement to optimize phosphorus removal throughout the year since this will help control the annual nutrient loading for this facility which has larger flows during the school term when compared to the summer months.

Response #7: The comment is now part of the public record.